TOOLING & PRODUCTION

The Magazine of Metal Working Methods

JUNE 1961

Minimal Motion Tool Changer Refines NC
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Quality Without Increasing Costs . . . page 41
Cold Rolling Answers Demand . . . page 45
Transistor Meets Up With QC . . . page 47

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AT THE FULTON SYLPHON DIVISION
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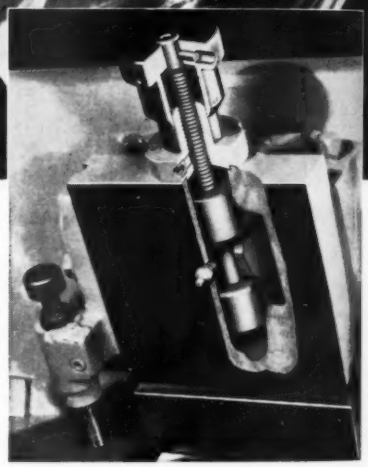

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TOOLING & PRODUCTION
The Magazine of Metal Working Methods

VOL. 27, NO. 3
JUNE 1961

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TOOLING & PRODUCTION MAGAZINE

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personally speaking...

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Some months ago in this column I mentioned that we would be sending second copies of given issues to small, selected groups of Tooling & Production readers. The purpose was to elicit certain information which we would use to help us develop editorial content that would be of continuously increasing pertinence to you. My reason for mentioning this now is to tell you that the response we have had has been exceedingly gratifying. If you have been one of our readers who has given us a response, please accept our thanks. This program will be continued each month. If you receive a request to mark a copy of Tooling & Production to be sent back to us, we hope you will find the little time it will take to do this.

Cordially yours,

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Publisher

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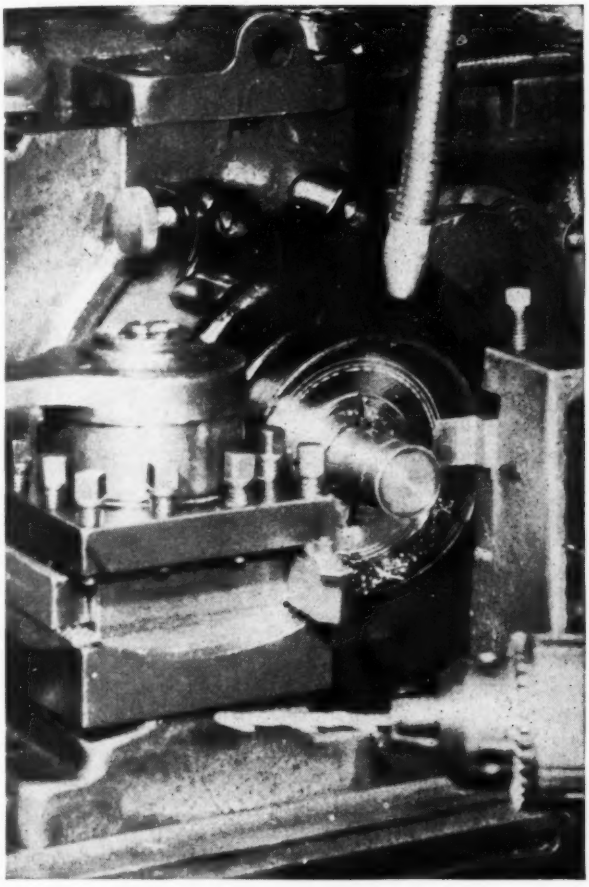

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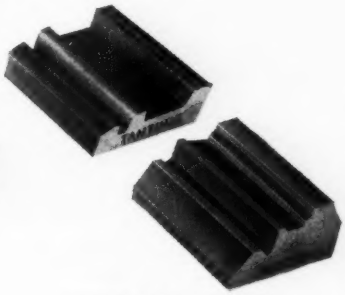

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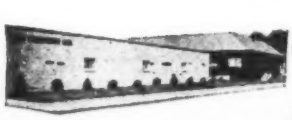

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CIRCLE INFORM-A-GRAM KEY NO. 8

Talk of the Month

The Production Man's Role in Product Reliability

by H. P. Kean

This article was excerpted from a talk by Mr. Kean, of Wright Aeronautical Division, Curtiss-Wright Corporation, to the Society of Automotive Engineers at their National Aeronautic Meeting in New York.

AS WE ADVANCE into the era of reliability at an ever quickening pace, we should pause for a moment to see if everyone is aware of his role. In our haste to develop the technical phase of reliability, we have sacrificed some emphasis on the part played by the production man.

Most production personnel continue to fight their daily problems without any real knowledge of their responsibility in reliability. They are exposed to definitions from military specifications or technical journals, but this only tends to convince them that reliability has nothing to do with them — that it is solely the responsibility of design engineering and statistical departments.

This is true of the first phase of reliability, which we might call "designed-in reliability." Of equal importance is the "built-in reliability" by the man building and servicing the product — the production man. Therefore, I propose a definition of reliability which includes both designed-in and built-in reliability: "Product reliability is keeping the customer satisfied."

To keep the customer satisfied, we must be confident the product will function when, where, how, and for as long as required. Business and production men have been aware of this since they began thinking about the concepts involved in manufacturing. Reliability as a concept is not new, but the techniques required to make the sophisticated products of the electronic and missile age are.

. . . **Continued on page 10**

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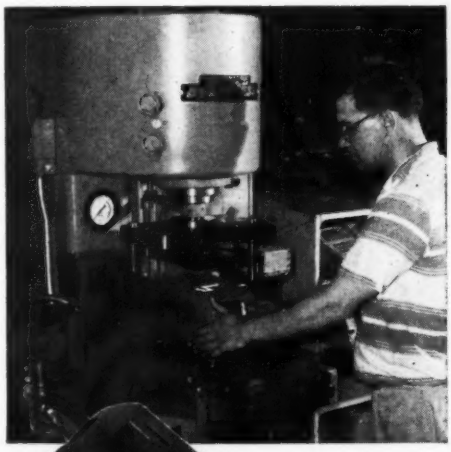

PERFORATING *16 different plastic case designs without tooling changes, this 8-ton Denison Multipress reduces inventory requirements and speeds production for Victor Adding Machine Company, Chicago. Typical case after punching, shown at left.*

SHARPLY REDUCED inventory requirements, no scrap loss and production line versatility are just 3 of the important advantages gained with this Denison hydraulic Multipress at Victor Adding Machine Company.

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. . . Month's Talk from page 8

'Team' Responsibility Advocated

Engineers responsible for these techniques are clearly identified in most companies. However, production men responsible for built-in reliability are not so clearly identified. I prefer to identify them as all of our manufacturing line personnel, and those in the allied organizations who provide services related to the product.

There has been a feeling that manufacturing personnel alone produce the product, and therefore they are the production men. But in a two or three man shop, the man on the machine is his own operation sheet writer, tool man, production control expediter, machine repair mechanic and foreman. He is truly a production man, not because of any one of his functions, but because of all of them.

As the shop grows larger, a distinct foreman is needed. He finds that it is more efficient to let one man make all of the jigs and fixtures instead of each man designing and machining his own — a toolroom is born. A portion of the production man's responsibility is shifted. The responsibility has not been eliminated, it has merely been shifted. So the toolmaker and the toolmakers to come, and eventually the toolroom supervisor, have a very specialized portion of responsibility for product reliability.

The shop becomes larger and specialization becomes greater. Now there are inspectors to share the responsibility formerly held by one man. A mechanic is hired for maintenance, and he inherits the problems of worn equipment and its effect on product reliability. Finally, a production control man and a manufacturing engineer arrive to assist in refining production techniques — the business is now considered large. A breakdown in the efficiency of any of these will affect product reliability. It is logical then that each be considered a production man.

Problems In Specialization

Specialization among production men has an increasing shortcoming. It tends to dampen the production man's responsibility toward product reliability. This is known to industrial managers, and many accept it as the price of efficiency.

The specialist who has always planned his activities around technologies now utilizes these tools almost exclusively — neglecting the technical which are always present. On the other hand, the line supervisor is relinquishing more and more responsibility for investigative and corrective work to the specialist. He confines himself to the job of managing people, costs, and schedules. Shouldn't each production man pursue that activity for which he is best trained? Isn't it wiser to prevent the production engineer from becoming involved with scheduling and personnel clashes on the "floor"? Isn't it logical to discourage the production supervisor from spending his time investigating technical problems? It is difficult to answer no to these questions because of their general nature. However, on any specific problem, we should certainly expect the

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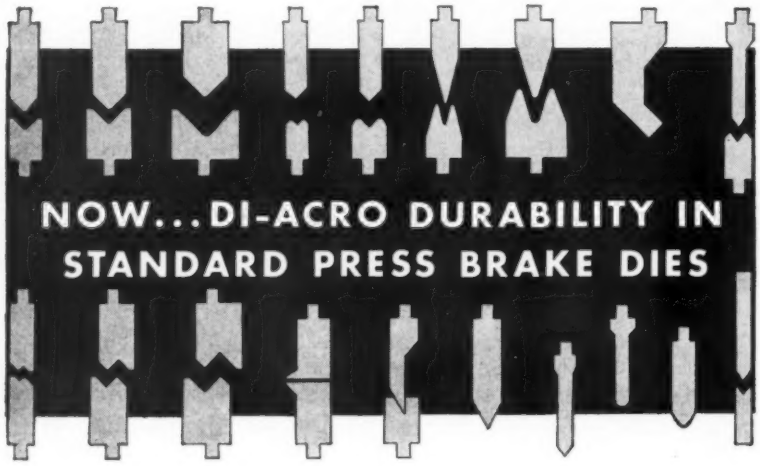

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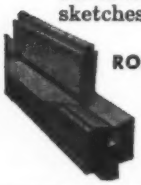

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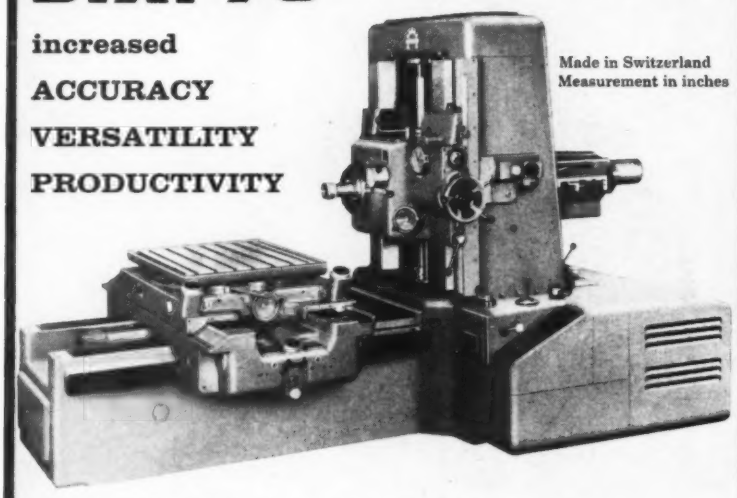

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. . . Month's Talk from page 10

production engineer or the production supervisor to rely on experience and intuition along with scientific analysis. The difference lies in the degree of each that is expected from the two men. It is this relative degree, and its effect upon product reliability, that is not yet clearly defined.

An Interesting Example

To illustrate, a thrust-washer was produced by machining the oil relief in both faces and then grinding the remaining area flat. A certain amount of out-of-flatness was tolerated as the piece was somewhat flexible. A process engineer was requested to find a way to manufacture the washer cheaper, preferably by stamping, and worked on the problem until he developed an acceptable process. Manufacturing approved a machine as capable and inspection reported that the parts were to blueprint. To all outward appearances, this was another job well done.

Unfortunately, the stamping produced high spots along the oil relief. They were within blueprint specification, but the out-of-flatness was different from that previously experienced. The high spots caused excessive wear on the mating part that led to customer dissatisfaction.

This could have been prevented although it was a very subtle difference without any real indication of the potential trouble. Customer satisfaction in the form of part performance had been omitted. The process engineer did his job as requested — he found a cheaper way. The stamping specialist approved the machine, as requested. The inspector performed as requested — he determined the dimensional adherence to the blueprint. Even though each man was aware of the difference in flatness, none thought it worth mentioning because it fell within the blueprint tolerance. To them, this was the responsibility of some other specialist — the design engineer. Had one of them felt responsible for final product reliability, he would have requested a performance test.

. . . Continued on page 18

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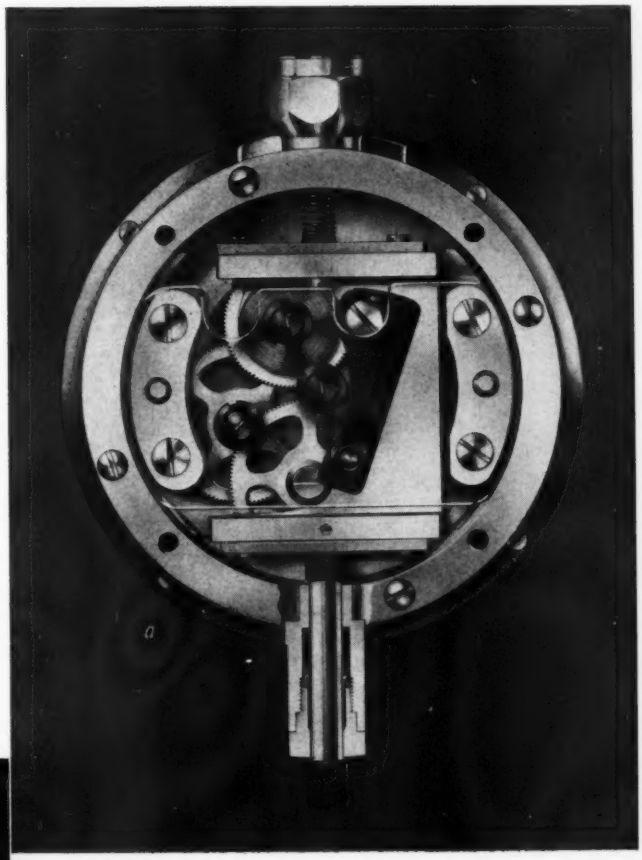

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NOW...

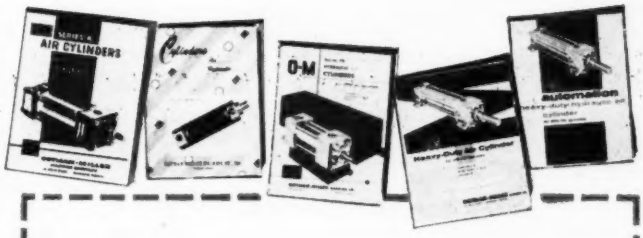
*1 ½" to 8" bores

There's an O-M Cylinder for Every Purpose

Meet JIC Standards

With the introduction of the new O-M Series "K," Square Head Air Cylinder, we can now supply the right air or hydraulic cylinders for your specific applications on low or high pressure systems. Ruggedly constructed of the highest quality materials, accurately machined to close assembly tolerances, O-M Cylinders operate with high efficiency and are quickly and easily maintained.

Whether your spec's call for a cylinder for a single operation or a variety of cylinders for a sequence of operations under continuous automatic cycling, there is an O-M Cylinder to meet your requirements. O-M Cylinders are individually tested at the factory and are available with standard or oversized rods, completely interchangeable parts and mounts.



Mail coupon TODAY for latest Bulletins showing construction and dimensional details, engineering drawings, capacity chart and mounting data.

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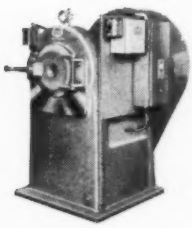
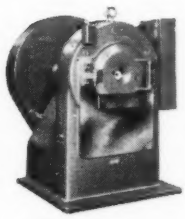
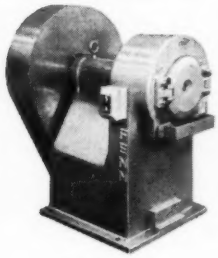
ARE YOU MACHINING WHEN YOU SHOULD BE SWAGING?



Rotary Two-Die

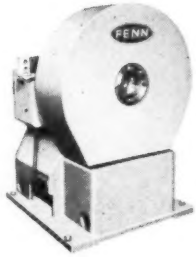


Rotary Four-Die



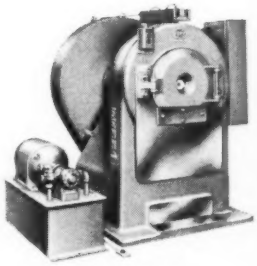
Long Die

Cost conscious manufacturers are finding it extremely profitable to design the components of new products . . . or redesign old ones . . . for production on Fenn swaging machines. What's more, in many cases swaging makes it better. On the *money saving* side, here are important considerations. Low investments in both machines and dies, the absence of chips with resulting savings in both metal and chip handling, lower labor costs because highly skilled operators are not required, and savings in time . . . for swaging is simple in operation, whether manually or mechanically fed. On *making it better*, swaging improves the physical characteristics of the metal, imparts a high finish, maintains continuous accuracy to within ±.001″, and performs many operations possible by no other method. Your nearest Fenn sales engineer can competently advise you on possible application to your product.



Stationary Die

For complete guide to rotary swaging and technical data on the Fenn line, write for Catalog SM-60. The Fenn Manufacturing Company, Fenn Road, Newington, Connecticut.



Hydroformer

Only FENN *makes all types of swaging machines*

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Why the Contract Shop Owner Prefers PRODUCTO Die Sets

They help protect his profits

The contract shop owner prefers Producto die sets because they help protect his die performance...his delivery promises...his profits.

The shop owner favors Producto because he can choose from a wide range of die set styles and thicknesses in steel, semi-steel or a combination.

He knows that when his dies are mounted in Producto sets, they will retain the precision built into them. He can expect maximum die life, maximum production with minimum press downtime for regrinding.

The shop owner likes the fact that Producto offers him a choice of two classes of precision, and that *he pays only for the amount of precision he buys.*

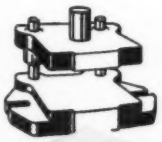
He knows that whoever handles the die will spend the least possible time taking it apart and putting it together because Producto's Qwik-Fit Guide Pins minimize die set assembly problems.

Most important, the shop owner can depend on efficient Producto service and strategically-located Producto distribution centers to protect the delivery promises he makes to *his* customers.

When the contract shop owner thinks in terms of protecting his profits, he thinks of Producto die sets and accessories. You should, too.

NEW DIE SET CATALOG No. 12 is another reason the shop owner prefers Producto. It makes selection and ordering really easy. Write for your free copy today. And ask to receive Die Set Digest, too.

THE PRODUCTO MACHINE COMPANY
945 Housatonic Ave., Bridgeport 1, Connecticut



PRODUCTO

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

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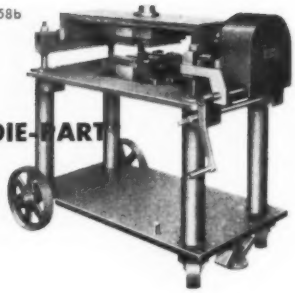
2958b



PROGRESSIVE DIE MAKERS

Exclusively Yours!

In use, punch is attached to underside of top plate and aligned with die. Die is then attached to middle plate. With crank in lower position top plate is raised and lowered, separating or fitting punch and die. Leverage is 200# of pressure-or-pull for each pound of energy applied to crank. With crank in upper position top plate can be rotated 360° to bring punch into position for inspection and correction.

Both surfaces of top plate and top surface of middle plate are machined for accuracy and expertly fitted for parallelism. Zero position of top plate, which re-aligns punch and die after inspection, is achieved when positioning pin enters alignment hole.

Load Capacity	2,500 lbs.
Top Plate Travel	18¼"
Top Plate Size	31¼" x 12"
Middle Plate Size	32¾" x 24"

DIE-PART is the newest member of an old and distinguished family of portable elevating tables as shown below.

2958c

PORTELVATOR ® "50-6"

A HANDY HAMILTON PORTABLE ELEVATING TABLE

The Hamilton line of standard portable elevating tables includes manually operated four wheel and six wheel models in various sizes and with lift capacities from 1,000 to 5,000 pounds. Each unit features a high speed arrangement for light loads or rapid return. Rubber tires may be specified if desired. Hand crank may be operated from a side position or from an end position also as specified.

Many additional features are available. These include extended top plates, roller conveyor tops, perimeter rail enclosures, and the like. For complete information please write for our FREE Bulletin No. 2958c.

Complete operating information, including specifications and dimensions, may be found in our FREE DIE-PART BULLETIN NO. 2958. Please ask for it by name and number.

THE HAMILTON TOOL COMPANY

832 SOUTH NINTH STREET, HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Month's Talk from page 12

A Truism to Remember

It is the responsibility of all production men to consider the effect on the customer, as well as the benefits to management.

If we accept this reasoning, we must find the tools to implement it. Oddly enough, when we look for these scientific tools we find many are already available and in use: scientific techniques, behavioral considerations, intuitive reasoning, and experience. But rarely do we see them all in use simultaneously.

Analysis without consideration for the validity of the data source is dangerous. Acceptance of intuition with reasonable evidence is equally dangerous. There must be a blending of decision-making techniques among our production people. No one technique can stand alone. All too often technically oriented engineers rely solely on calculated answers with little regard for reasonableness as measured by experience.

Such a situation was recently prevented by the foresight of a stress engineer and the experience of a weld technician. A mismatch in the girth weld between two cylinders of a missile case was calculated for strength by the stress engineer. A calculated answer showed that the case had no chance of passing pressure tests. To stop production at that point meant serious jeopardy of delivery, as this was a special unit. It appeared that there was no choice other than to start time-consuming rework.

But before releasing his final recommendation, the stress engineer consulted with a welding technician to see if there were any extenuating circumstances not readily apparent. The experienced welding technician knew that a mismatch of this nature is not always caused by radial slippage alone. Sometimes a type of warpage occurs which does not severely decrease over-all strength. Since the odds against failure seemed greatly reduced, they finished the case and tested it under instrumentation. The test was successful.

Unlike the foregoing example, there are times when practical-minded line personnel disregard the more refined techniques as purely academic, when in truth they could be utilized to solve otherwise "unsolvable" problems.

Integration of Operational Techniques

How then can we perform a marriage of ideas among the two groups of production men? How can we temper operating techniques to benefit product reliability? The best way is through respect for the views of others, gained through other successes. However, this can only be expected after lengthy personal relationships. A catalyst for this reaction is an over-all goal which operates at the production man's level. Nothing stimulates the blending of ideas and actions so effectively as a common motive (such as the effect of war or disaster upon people).

I propose that this common goal be customer satisfaction. This should form the basis for coordinated action between all departments.

Targets For Coordinated Action:

1) *Understand operation of product* — Production men should not neglect the operating function of the end product. Nothing stimulates pride of workmanship more than knowing how and where your work is to be used.

2) *Recognize equipment capabilities* — In many cases, production supervisors are not conscious of the subtle *incapabilities* of their machines. The general philosophy and techniques used in process capability studies are not so difficult or time-consuming that every concerned production supervisor should not avail himself of this knowledge.

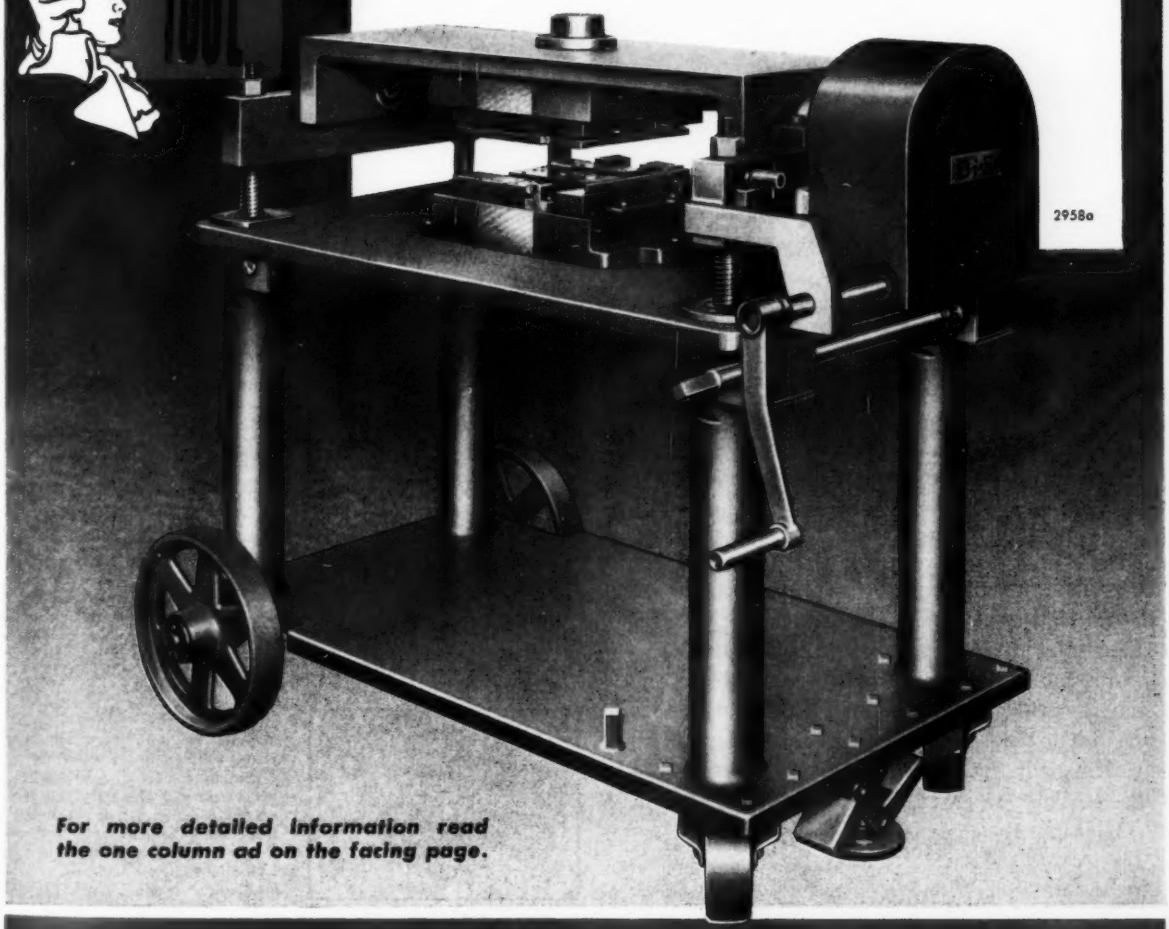
3) *Develop effective trouble-shooting* — Each line supervisor should be taught how to use simple analytical methods to help identify problems. Engineers should be instructed to investigate the reasonableness of a conclusion, even in the face of what they consider to be strong evidence. Consideration of human behavior as a factor in problem solving should be mandatory. end

PROGRESSIVE DIE MAKERS...

Exclusively Yours!

DIE-PART®

A portable device for maintenance, fitting, and testing of dies. Increases accuracy and reduces costs . . . invariably. Install it and change your competitive situation over night. Be able to underbid competition and yet show a profit.



For more detailed information read the one column ad on the facing page.

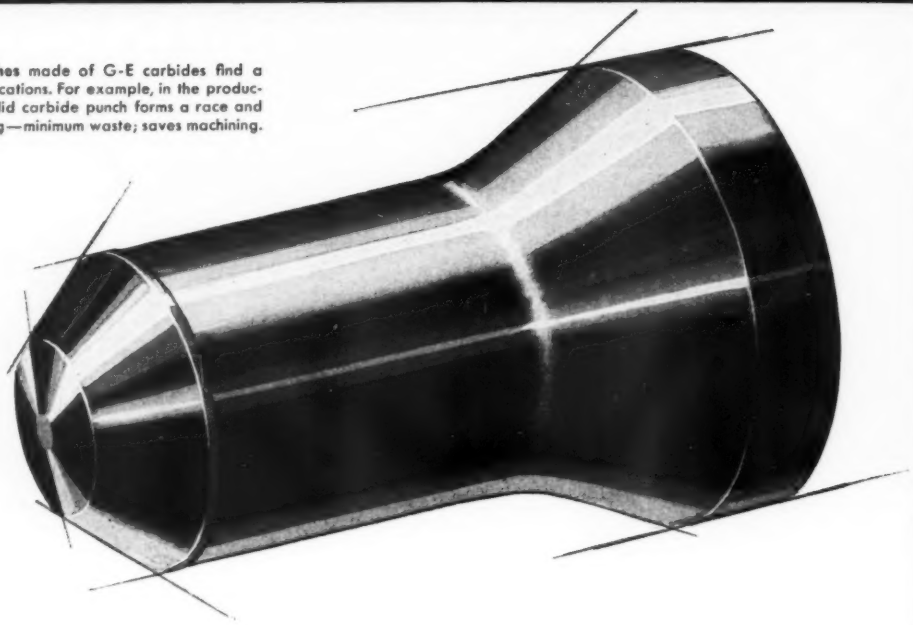
THE HAMILTON TOOL COMPANY

832 SOUTH NINTH STREET HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 19

"MOVING METAL" with Carboloy® Cemented Carbides

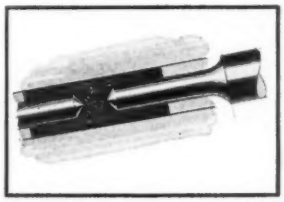
Cold extrusion punches made of G-E carbides find a wide variety of applications. For example, in the production of bearings, a solid carbide punch forms a race and cup from one steel slug—minimum waste; saves machining.



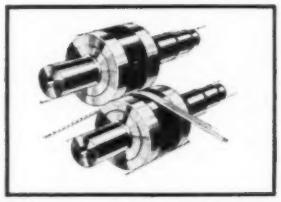
Carboloy cemented carbides save machining time, reduce costs

How efficiently you *"move metal"* from one shape to another depends on the quality, accuracy and uniformity of the carbide you use. General Electric Carboloy carbides for coining and extruding punches, wire-flattening and sheet metal rolls are designed to do the job better, in less time, at lower cost, with less metal waste.

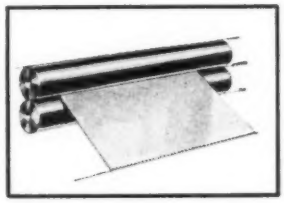
Continuing research by General Electric's experienced metallurgists and technicians results in carbides of highest quality and uniformity—dependability for the job at hand. Call your Carboloy Die Distributor or Die Maker to help you *"move metal"* at lower cost. Or write: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Ave., Detroit 32, Michigan.*



From solid slug to wrist pin—2,000 an hour! Increased production is but one of the advantages when you use extruding and coining punches of Carboloy cemented carbides. You get uniform weight, surface finish, improved strength.



When it comes to wire flattening, rolls of Carboloy cemented carbide outlast steel rolls many times. Smooth, wave-free roll surfaces produce rolled, flat wire products of exceptional quality and finish; consistent uniformity.



You get uniform, more even sheet when you use rolls of Carboloy cemented carbides. Roll structure is uniform throughout; excellent for working stainless steel. Carboloy rolls last longer and do jobs not possible with steel rolls.

CARBOLOY® CEMENTED CARBIDES

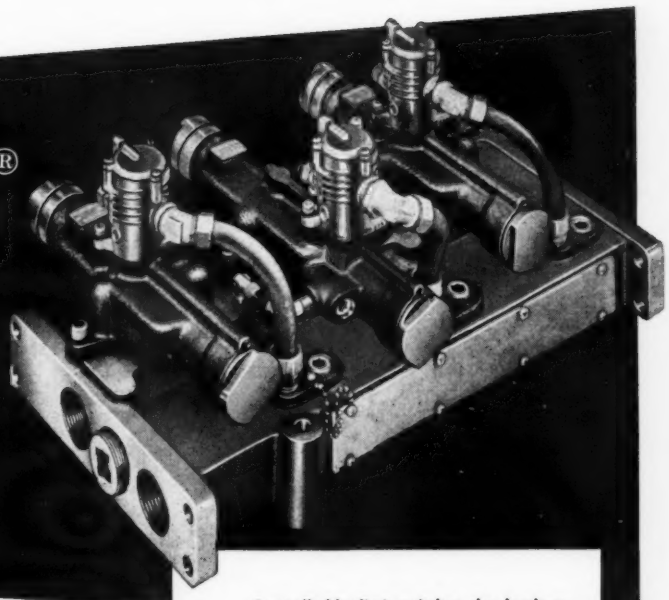
METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

CIRCLE INFORM-A-GRAM KEY NO. 20

SPEED KING® Deceleration Manifold



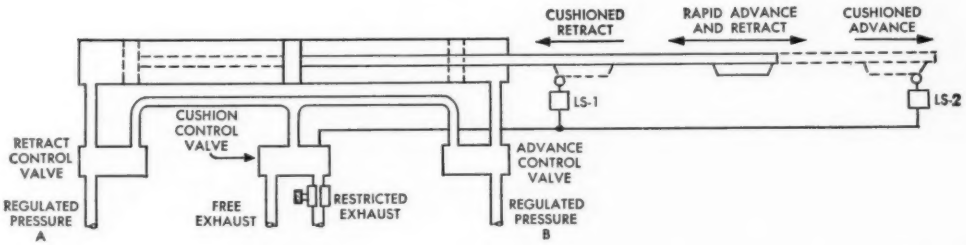
Controlled by limit switches, the deceleration unit permits rapid initial cylinder travel . . . then restricts cylinder exhaust to provide desired rate of cylinder cushioning. And, if needed, live air can be introduced momentarily to the exhaust side of the cylinder for added deceleration and cushioning.

...for positive cushioning of high speed transfer units

The Speed King deceleration manifold controls double-acting cylinders on automated equipment moving masses weighing several hundred pounds . . . where rapid travel and precise, easily regulated cushioning, at any point in either or both directions, is required.

Rapid travel keeps production rates high . . . controlled deceleration and positive cushioning prevents damage to mechanisms . . . protects valuable dies and tooling.

Your Bellows-Valvair Field Engineer can advise you on control of large, fast-moving reciprocating units. Call him today.



- **RAPID ADVANCE** . . . advance control valve opens and exhausts to cushion control valve. Cushion control valve, de-energized, directs cylinder exhaust to free outlet.
- **CUSHIONED ADVANCE** . . . advance control valve remains energized. LS-2 energizes cushion control valve, diverting cylinder exhaust to restricted outlet.
- **RAPID RETRACT** . . . retract control valve exhausts to cushion control valve, which de-energized, directs cylinder exhaust to free outlet.
- **CUSHIONED RETRACT** . . . retract control valve remains energized. LS-1 energizes cushion control valve, diverting cylinder exhaust to restricted outlet.

Write for Bulletin MAN-11. Address Bellows-Valvair, Akron 9, Ohio, Dept. TP-661

Bellows-Valvair
AKRON 9, OHIO
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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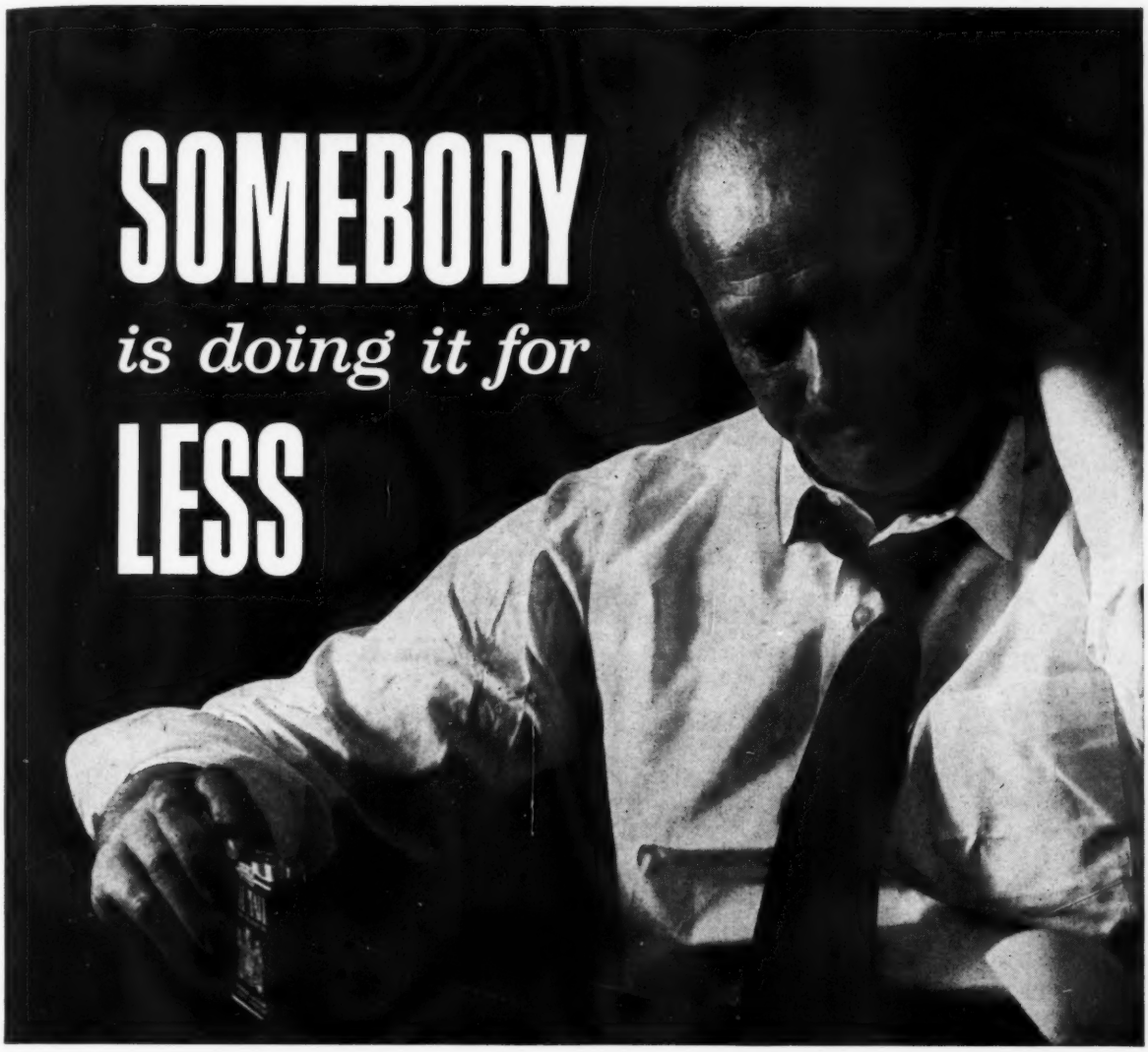

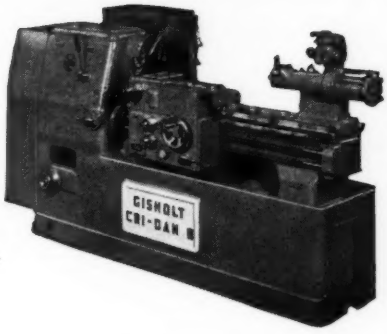

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D-15

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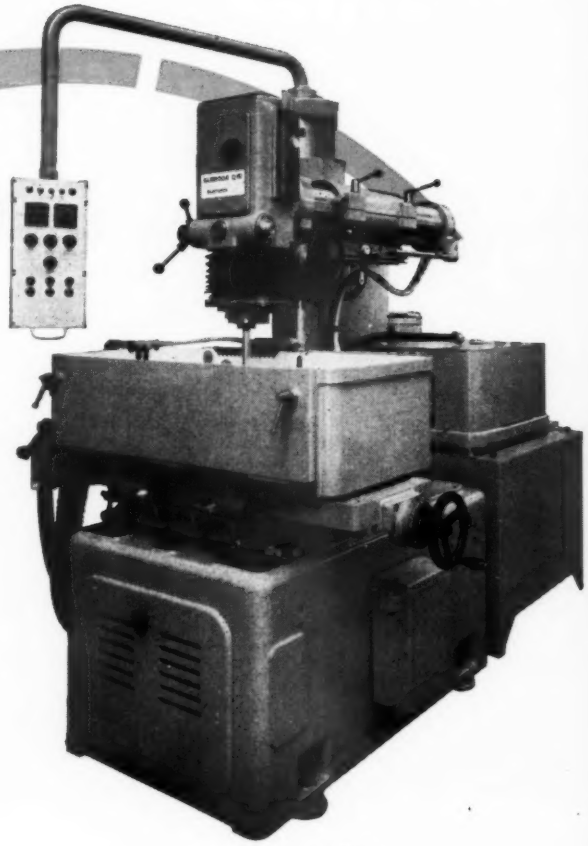
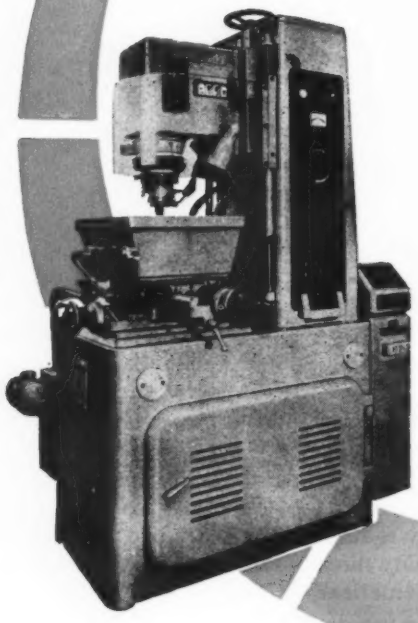
Unique Versatility: Machines are tailored to fit user's applications.
Hydraulic Servo: Electric Impulse Generator (EPL-500)





D-1

An outstanding high precision erosion machine to work and locate with ± .0002". Surface Finish Guarantee 10 micro inches.

CHARMILLES

CHARMILLES ENGINEERING WORKS, LTD.
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3608 E. 103rd Road
Seattle 55, Wash.—LA 2-2717

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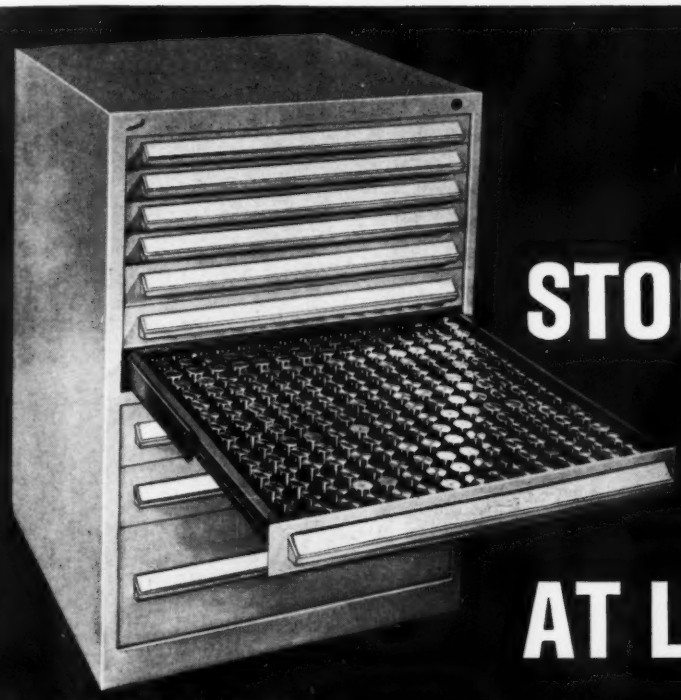
2353 So. Broadway
Denver, Colo.—RA 2-4609

CIRCLE INFORM-A-GRAM KEY NO. 24



STORE MORE, BETTER, AT LESS COST

THIS CABINET HOLDS THE ANSWER to efficient, time-saving, cost-cutting storage of parts, tools, instruments, accessories and sub-assemblies . . . because . . .

SPACE IS USED TO THE MAXIMUM. Drawers can be divided into unlimited arrangements, as small as 1½" x 1½"—or larger, right up to the full 25" x 25" drawer size. And if your requirements permit . . .

A VIDMAR INSTALLATION LIKE THIS will store more, better, in less space than any other storage system available. Vidmar cabinets are designed and built expressly for industry . . . eliminate "waiting time", dirt, breakage and pilferage.

You can start your Vidmar facility with one or more cabinets. All units are modular in design—can be arranged, re-arranged, and added-to as required. Drawers are interchangeable within each cabinet or other Vidmar cabinets, and a specially designed and constructed suspension and extension system assures strength and stability. Drawers hold up to 400 lbs. each, without sagging, even when fully loaded.

Before you revise or add to your storage facilities, or plan the storage in new construction, it will pay you to look into the time- and money-saving advantages of Vidmar. Write today: Vidmar, Inc., 2326 Reach Rd., Williamsport, Pa.

Vidmar CABINETS Division of Volkert Stampings, Inc.

CIRCLE INFORM-A-GRAM KEY NO. 25

NOW...low-cost AUTOMATION!

BUCKEYE DRILLING, TAPPING and FASTENING TOOLS

Cut production costs by employing the features of dependable, air-operated Buckeye Automation Tools:

- Small offset, as close as 1¾" center distance
- Models from 650 to 22,000 RPM
- Adjustable stroke 0 to 2" with micrometer accuracy
- Adjustable feed rate
- One type of tool features total stroke of 2", of which 1" may be fully hydraulically controlled, preventing break-through damage to material and to sensitive cutting tools . . . also incorporates adjustable rapid approach for minimum cycling time.
- Tool accessories provide signals to control mechanisms which will automatically shut tool off . . . actuate other tools for subsequent operations . . . or automatically position the next part.
- Buckeye engineers will work with you in applying these tools to fit your requirements for drilling, tapping, fastening, grinding, reaming, counterboring and wire brushing.

write today for descriptive literature, tracing templates and prices

Buckeye Tools CORPORATION

P. O. BOX 966, DAYTON 1, OHIO

Pioneering Power Tools for Industry Since 1920

CIRCLE INFORM-A-GRAM KEY NO. 26

Supplier Rating Program Assists in Quality Control

The aerospace industry, often first by necessity with new manufacturing methods, has fostered the development of a competitive approach to quality control that's consistent with the industry's critical responsibilities.

This system comes from Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn., and is called the "supplier accreditation program." This major aviation manufacturer is helping its subcontractors and vendors establish quality control systems that meet the high standards of the industry.

The result: benefits to Hamilton Standard in reduction of duplicate inspection of vendor items, and benefits to the vendors and subcontractors in the form of improved quality control methods that enhance their ability to meet price, delivery and quality requirements for all customers.

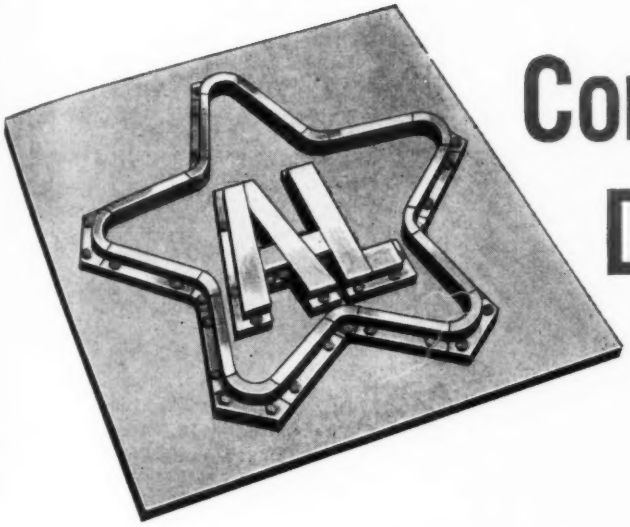
Suppliers qualifying for Class A status are certified as competent to supply products to Hamilton Standard under minimum controls. One such recent qualifier is The Torrington Co., Torrington, Conn. In awarding the firm its Class A rating, Hamilton Standard signified that it would perform "little or no inspection" of incoming Torrington bearings — a vote of confidence in Torrington's rigid quality standards.

Due to the potential savings represented by improved schedule performance and reduced inspection costs made possible by the program, Hamilton Standard has announced a policy of doing all business possible with suppliers who qualify under the program.

Several other New England subcontractors — forerunners of some 200 potential Hamilton Standard subcontractor-participants — have also received certificates.

Experience to date with the four-year-old program has been highly favorable, according to Ted C. Fisher, Hamilton Standard's quality control manager.

Mr. Fisher



Composite Die Sections

make fast, easy and inexpensive Blanking, Trimming and Beading Dies

To save valuable tool steel and to make equally substantial savings in costly diemaking time, use Composite Die sections from Allegheny Ludlum's Forging and Casting Division. These prefabricated die parts come in a wide . . . almost limitless . . . range of sizes and shapes. And they are easy to specify. A simple sketch with dimensions and descriptions of the work to be done brings you the shapes, heights, and grades of tool steel to match your requirements exactly.

Composite Die sections consist of fine A-L tool steel cutting edges (in all the grades you need), electrically butt welded by a special process to nonhardenable mild steel bases. Exact control of temperatures during welding and annealing gives you a bond that will not let go even under the most severe conditions.

Check these many advantages you get with Composite Die sections: You use less tool steel in your dies, and there is much less waste than with bar stock. Screw and dowel holes are easily drilled after the tool steel has been machined and heat treated—because the mild steel bases remain soft. Dowels are easier to fit, too. The back up style of assembly is not needed. Because the tool steel is reinforced and held securely by machine steel base, there is no cracking of sharp corners or long projections. There is less chance of distortion during hardening with A-L composite sections. And any slight warpage may be easily corrected without damage. You get firm, positive fit of sections on die shoes.

Salvage possibilities are also important—sections from obsolete dies can often be reused on new jobs.

Both straight and shaped sections are available with supporting ribs as needed. For more information on Composite Die sections refer to booklet FC4, a 28-page description which also covers smooth hammered **Forgings** and **Cast-To-Shape** tool steels. Ask your A-L representative for your free copy, or write: ***Forging and Casting Division, Allegheny Ludlum Steel Corporation, Ferndale, Detroit 20, Michigan, Address Dept.*** *TP-6.*

ALLEGHENY LUDLUM
FORGING AND CASTING DIVISION

3292

CIRCLE INFORM-A-GRAM KEY NO. 27

IT'S A FACT

FOR PRECISION HOLDING POWER
DAY-AFTER-DAY, YEAR-AFTER-YEAR

YOU CAN DEPEND ON DE-STA-CO TOGGLE CLAMPS

Contour checking fixture with De-Sta-Co clamps quickly checks accuracy of parts against master template.

FOR MORE FACTS

phone, wire or write for NEW 36-PAGE CATALOG

TOGGLE CLAMPS
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BLOWER HOUSINGS

DETROIT STAMPING COMPANY
340 MIDLAND AVENUE · DETROIT 3, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 28

June 1 National Machine Tool Builders' Assn. — 59th spring meeting, Mayflower Hotel, Washington, D.C.

June 5-8 Instrument Society of America — international instrument-automation conference sessions, Royal York Hotel, exhibit, Queen Elizabeth Hall, Toronto, Canada.

June 8-9 Malleable Founders Society — annual meeting, The Broadmoor Hotel, Colorado Springs, Colo.

June 11-15 American Society of Mechanical Engineers — summer annual meeting, Statler Hilton Hotel, Los Angeles, Calif.

June 13-16 Cornell University—seminars in industrial engineering, Ithaca, New York.

June 14-16 American Society of Mechanical Engineers — applied mechanics conference, Illinois Institute of Technology, Chicago, Ill.

June 19-23 American Standards Assn. — seminar, Engineering Societies Building, New York, N.Y.

June 21-24 National Tool & Die Manufacturers Assn. — summer board meeting, Schroeder Hotel, Milwaukee, Wis.

June 28-30 Joint Automatic Control Conference, (ASME, ISA, AIEE, AIChE), University of Colorado, Boulder, Colo.

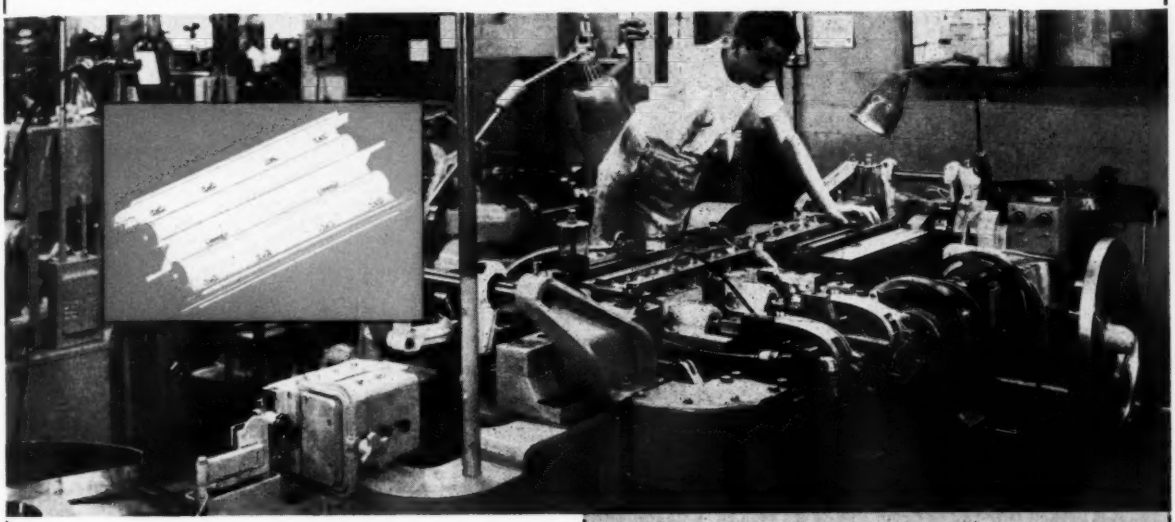
July 18-20 Western Plant Maintenance and Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif.

July 24-28 Chicago Association of Commerce and Industry — World Marketing and Inter-American Industries Conference in conjunction with the International Trade Fair **July 25-August 10** McCormick Place, Chicago, Ill. One category features machine tools.

U.S. DUPLEX MULTI-SLIDE INCREASES OUTPUT *of assembled components* BY 746%

CUTTING PRODUCTION OPERATIONS BY 66%

These are two of the benefits realized by the Precision Parts Section, General Electric Company, of Springfield, New Jersey, from just one U.S. Duplex Multi-Slide.

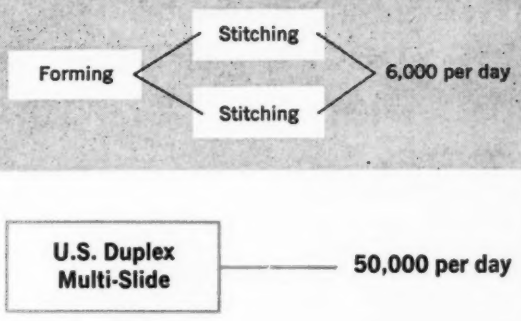


Until the installation of The new Symmetrical U.S. Duplex Multi-Slide, G. E.'s Precision Parts Section was producing complete rectifier plates at the rate of 6,000 per 8 hour day — in a 3 operator production set-up.

The U.S. Duplex Multi-Slide is the only symmetrical duplex machine of its type built.

Two or more parts can be produced simultaneously — and assembled where required.

Bulletin #36-P will be sent on request.



MULTI-SLIDE

U.S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 29

Chip – magnified 4 times – produced by machining Waspalloy with Rex 49

New Rex 49 outlasts other special purpose high speed steels better than 2 to 1

Rex 49 – a new high speed steel that can machine today's "difficult-to-cut" metals *faster and more economically* than existing special purpose high speed steels – is another in the long line of advances and improvements in specialty steels to come from Crucible research.

Crucible laboratory tests indicate that tools made of Rex 49 last as much as 4 times longer than other special purpose high speed steels . . . and it has a base price ⅓ to ½ of these steels.

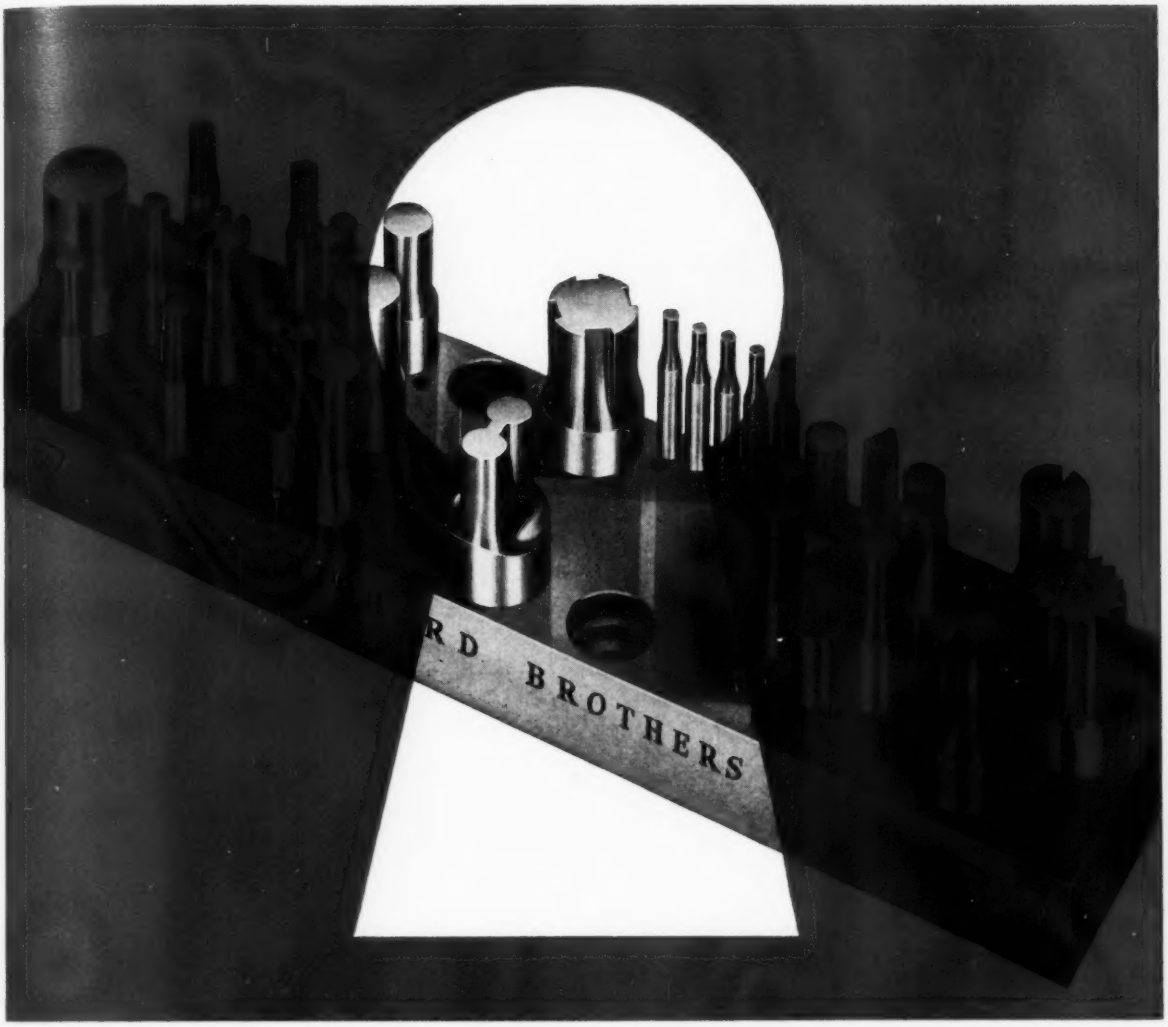
Both laboratory and field reports prove the advantages of Rex 49 for machining hard, tough or abrasive metals, such as heat-treated alloy steels, stainless, titanium, and superalloys. These tests also indicate that Rex 49 has advantages in machining the more conventional metals through increased speeds, feeds and depths of cut — and Rex 49 can be hardened with conventional high speed steel heat treating equipment.

Rex 49 is indicative of Crucible's continuing leadership in the development of improved high speed and tool steels.

For more information, write: *Crucible Steel Company of America, Dept. HF25, Four Gateway Center, P.O. Box 88, Pittsburgh 30, Pa.*

CRUCIBLE STEEL COMPANY OF AMERICA

CIRCLE INFORM-A-GRAM KEY NO. 30

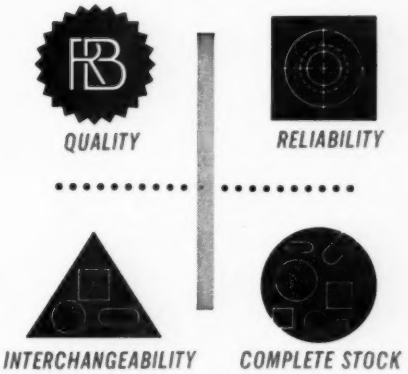


KEY TO EFFICIENT, ECONOMICAL OPERATION

In any sheet-metal piercing operation where frequent tool change is required, Richard Brothers standardized interchangeable tooling can be the key. Complete interchangeability of standard or special punches and die buttons within the same RB retainers saves time, cuts costs.

You save design time by applying RB standardized features. You save die construction time because RB tools are ready to use. You save press down-time because RB tools are so easy and quick to change—yet positive alignment is assured. And Richard Brothers tools meet the highest standards of the industry because of the finest quality control of materials, heat treating, machining and inspection.

Specify Richard Brothers punches, die buttons and retainers for more efficient, economical operation.



RICHARD BROTHERS PUNCH DIVISION

ALLIED PRODUCTS CORPORATION
DEPT. G6 • 26500 CAPITOL AVENUE • DETROIT 39, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 31

HARDINGE STOCKS COLLETS . . . .

. . . . . AT ELMIRA, N. Y.

AND **COLLETS** AT ATLANTA, GEORGIA
AND **COLLETS** AT BOSTON, MASS.
AND **COLLETS** AT CHICAGO, ILLINOIS
AND **COLLETS** AT DAYTON, OHIO
AND **COLLETS** AT DETROIT, MICH.
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AND **COLLETS** AT NEW YORK CITY
AND **COLLETS** AT PHILADELPHIA, PA.
AND **COLLETS** AT OAKLAND, CALIF.
AND **COLLETS** AT MINNEAPOLIS, MINN.
AND **COLLETS** AT ST. LOUIS, MO.
AND **COLLETS** AT SPRINGFIELD, N. J.
AND **COLLETS** AT ROCHESTER, N. Y.
AND **COLLETS** AT PORTLAND, OREGON
AND **COLLETS** AT SEATTLE, WASH.
AND **COLLETS** AT TORONTO, CANADA
ALSO **FEED FINGERS and PADS**

IN THESE LOCATIONS FOR IMMEDIATE DELIVERY

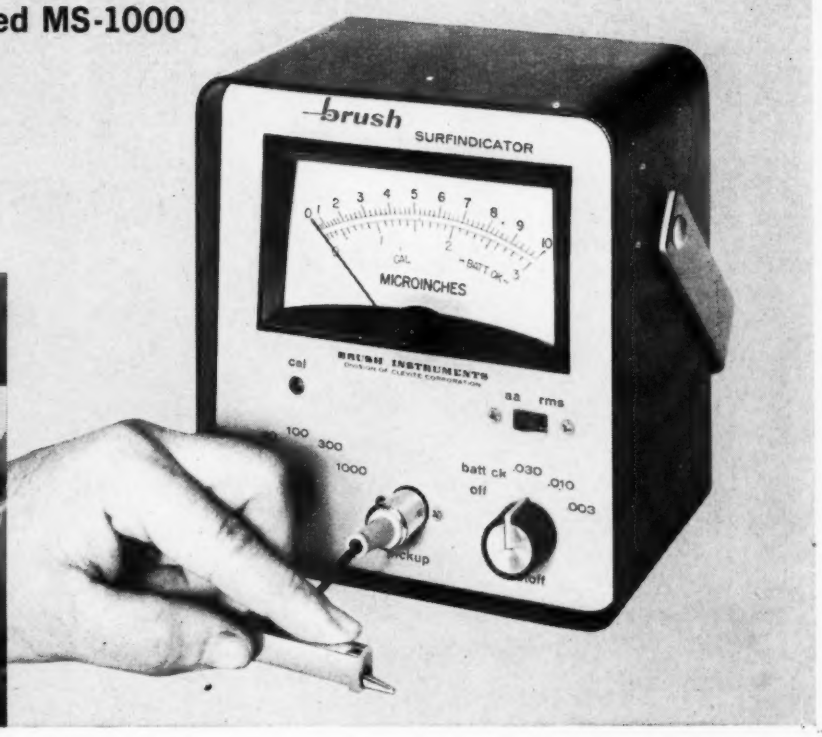
HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 32

with THE BRUSH SURFINDICATOR "meeting specs" is just part of the pay-off...

NEW battery operated MS-1000

Standard 110 Volt BL-110

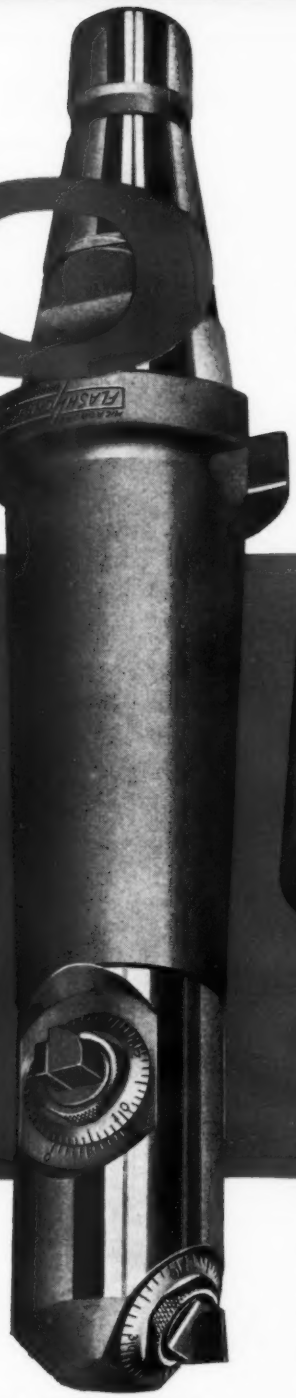


An Ohio missile-parts maker* knows why. His Surfindicator not only eliminates surface rejects but also cuts machine downtime 60%. Quick, accurate tool checks . . . at his machines . . . insure optimum tool changes to greatly extend productive tool life. *Anyone, anywhere* can measure *any* finish from 1 to 1000 microinches with a compact, portable Surfindicator. Choose the standard model or the ultimate in portability, the new battery powered, completely self-contained, 5½ lb. MS-1000. Ask your nearest Brush distributor for a demonstration. *Write for our new booklet . . . 16 pages on how Surfindicator improves profits in five major operating areas . . . production, tooling, engineering, quality control and research.* *name on request

brush INSTRUMENTS
DIVISION OF
CLEVITE CORPORATION
37TH AND PERKINS CLEVELAND 14, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 33

now... over 330 standard Microbore boring bars from stock!



Your choice of over 330 Microbore standard single-tool or two-tool precision boring bars. A complete range of sizes and types available for boring and facing operations on any make of boring machine, milling machine or turret lathe. *Microbore micrometer vernier adjustment of each tool point* makes it possible to quickly set tools to *precise dimensions.* Boring range from ½″ to 7¼″ dia. Standard Boring Rings and Adapters extend range to 13¾″. Available with Straight Shank, NMTB Taper, Morse Taper or Flash-Change. Carbide, ceramic, or high speed steel cartridges. Ordering is Simple! Fast! Direct! Standardize on Microbore—the complete tooling system.

Catalog No. 58 lists industry's most complete line of standard general purpose precision boring bars. Write for your copy.

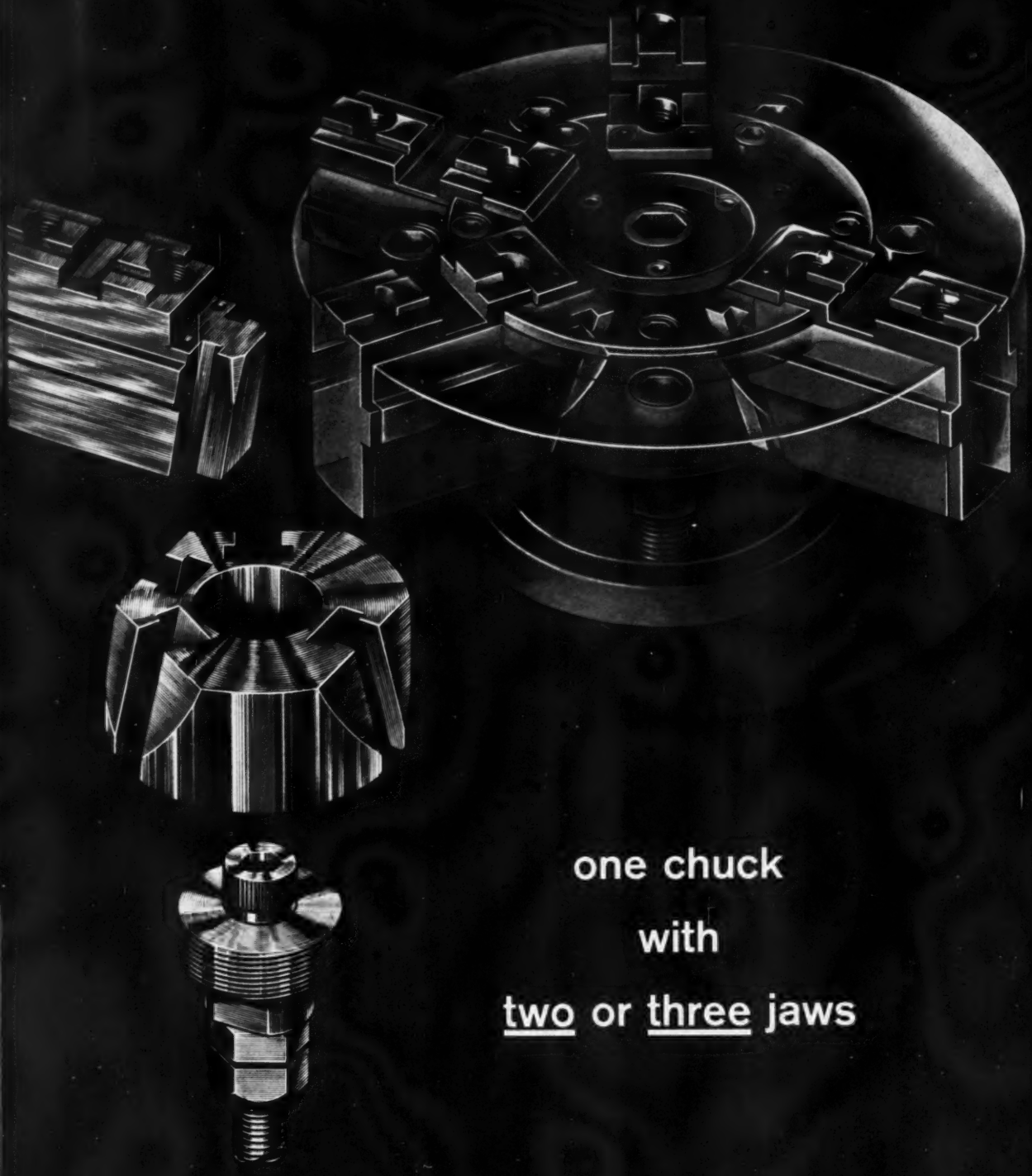
Also available—special tooling designed from your part prints by our Proposal Engineering Department.

DeVlieg Microbore® System

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

Fair Street, Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 34



one chuck
with
two or three jaws

SKINNER DUAL PURPOSE POWER CHUCK

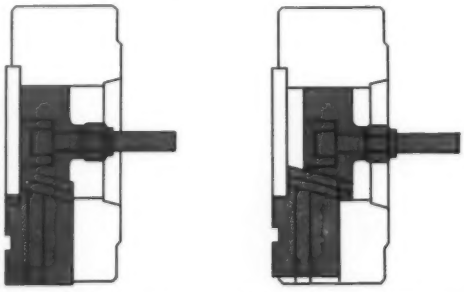
One Dual Purpose Power Chuck saves the cost of an additional chuck

Skinner dual purpose standard power chuck is designed with four master jaws so that it may be used as a two or three jaw chuck. It is no longer necessary to pay for one chuck to machine round work, and an additional chuck to machine odd shapes and castings. Not only do you save the cost of an additional chuck but you get all of the advantages of Skinner power chuck design listed below. Skinner dual purpose power chucks are available with adjustable, non-adjustable, or serrated jaws, in sizes 8″ to 36″.

A—Transparent view of dual purpose power chuck B—Ma
C—Wedge D—Drawbar Stud and Wedge plug

Skinner wedge-type chuck offers these advantages

- Allows automation of long production runs.
- Reduces operator fatigue—air performs the muscle work.
- Adjustable gripping pressure—air pressure can be adjusted for light or heavy chucking—is not left to the judgment of the machine operator.
- Work can be gripped internally or externally.
- Assured continued high accuracy because of wedge design (see illustration).
- Reduced wear because of hardened parts—models available with flame hardened center hole and jaw locks.
- Complete line—heavy and light duty models in sizes from 4″ through 36″.

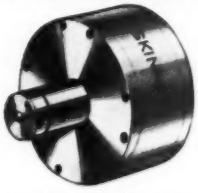


Wedge at top of stroke—jaws fully open (External gripping)

Wedge at bottom of stroke—jaws fully closed (External gripping)

The wedge and three jaws—only four moving parts—operate as a collet does with accuracy maintained over the whole range. The wedge angle is 14° which was found to be the most efficient angle for maximum power and jaw travel. With this wedge construction, the grip of a Skinner power chuck holds as set—even if the air line is broken—until opening power is applied in the opposite direction.

Skinner Power Chuck Accessories



Double-Acting Rotating Air Cylinders for use with power chucks and fixtures provide maximum pressure with a minimum amount of air. Cylinder walls are burnished to provide maximum sealing life. Cylinders in sizes 6 to 18 with semi-steel bodies are designed for low speed operation. Aluminum body cylinders in sizes 4 to 20 are designed for high speed operation.

Packaged Power Chucking Assemblies are available for Atlas, Cintilathe, Hardinge, Logan, Regal, Sheldon, South Bend, and many similar lathes. Assemblies are also available for Brown & Sharpe and similar automatic and hand screw machines to permit chucking of cold drawn parts, small or odd shapes and castings. Packaged assemblies consist of chuck with two or three jaws, threaded drawbar or drawtube, rotating air cylinder, cylinder adapter and necessary mounting for the individual machine.

Power Chuck Fixture, air or hydraulically operated, holds work for drilling and milling machines and for other bench and machine installations. Available in many jaw types in sizes 5″ to 36″.

A Complete Line of power chucking accessories includes hand, foot, and solenoid valves, drawbars, air units, and soft blank top jaws.

* * * *

For complete information about the Dual Purpose and other power chucks and power chuck equipment, contact your Skinner Representative, Distributor, or write us at the address below.

SKINNER CHUCKS

THE CREST OF QUALITY

SKINNERCHUCKS

SKINNER-HORTON CHUCK DIVISION
SKINNER PRECISION INDUSTRIES, INC. • NEW BRITAIN, CONNECTICUT, U.S.A.

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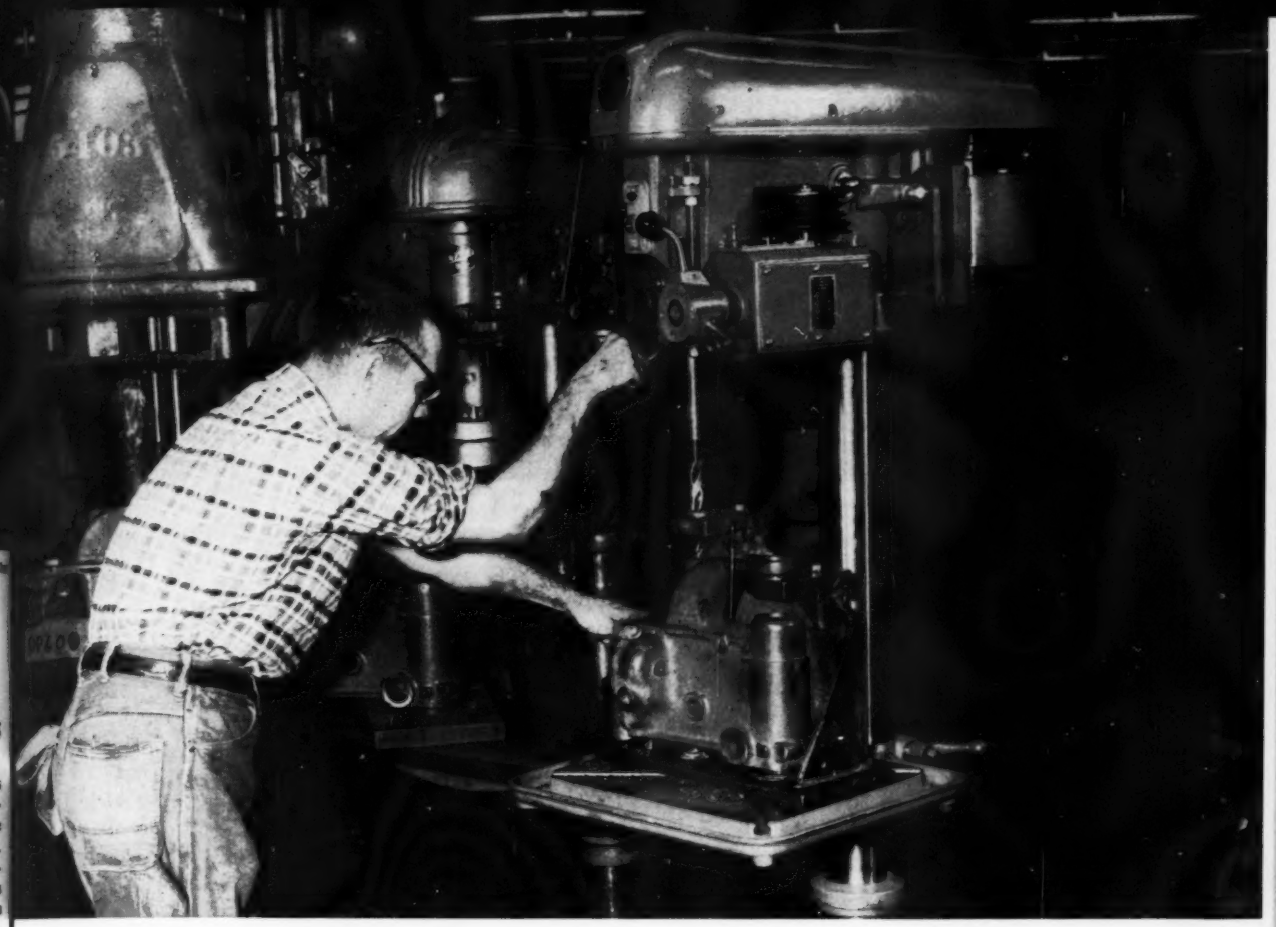
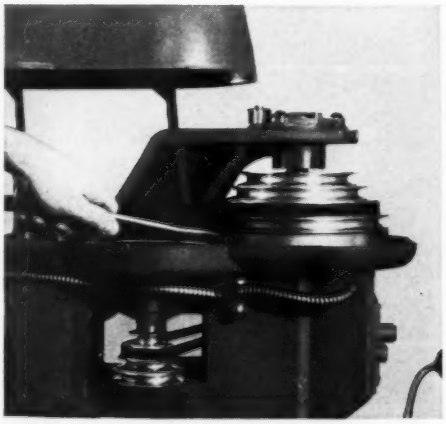


2600 rpm or 110 rpm—you can do more with a Delta 20" *geared pulley head* drill press



All you have to do is turn a key to change from direct belt drive to gear drive on any one of the 28 models of this machine. The 20" geared pulley head drill presses can be used in manual as well as semi and fully automated set-ups to meet a variety of production needs.

FREE BROCHURE describes complete line of 20" drill presses in floor, bench, multiple spindle and overhead models. Write: Rockwell Manufacturing Company, Delta Power Tool Division, 622F N. Lexington Ave., Pittsburgh 8, Pa.

You can drill and tap large holes, do spot facing, reaming and counter-boring at extra slow speeds because these drill presses have planetary gear spindle pulleys which reduce spindle speeds and multiply torque. Hand feed models offer ten speeds, five in direct drive and five in gear drive, while eight speeds are standard on power feed models. Use of a longer than standard belt adds eight more speed selections to either model.

These rugged flexible drill presses have the capacity to handle production metalworking jobs done by machines costing more than twice as much! See them in action and learn how they can help you cut drilling costs and improve drilling quality. Your Delta Industrial Distributor (listed under TOOLS or MACHINE TOOLS in the Yellow Pages) will give you the facts and figures.

DELTA INDUSTRIAL TOOLS

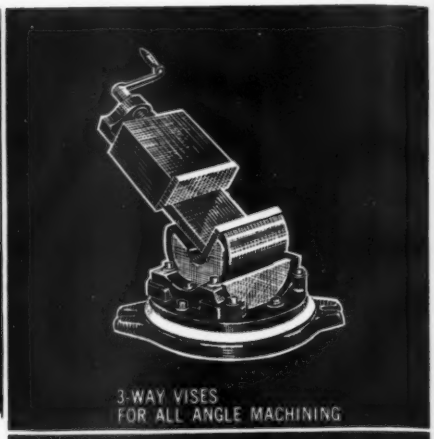
another fine product by

ROCKWELL

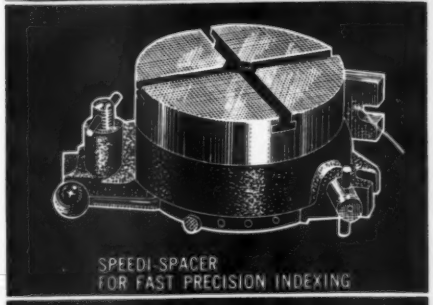
CIRCLE INFORM-A-GRAM KEY NO. 36

CIRCLE INFORM-A-GRAM KEY NO. 37

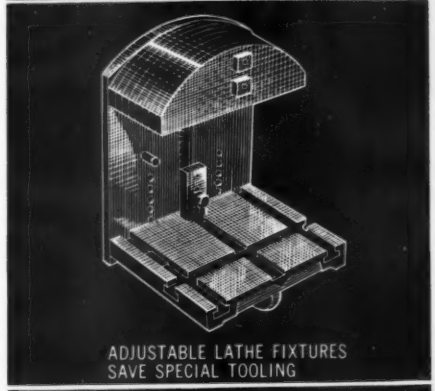
5 WAYS..... TO MAKE SET-UPS EASIER....QUICKER



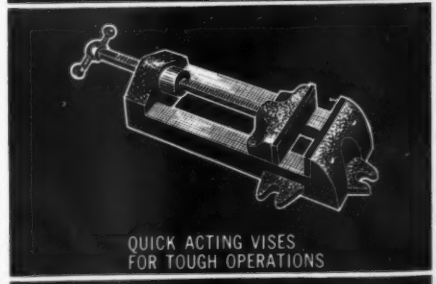
3-WAY VISES
FOR ALL ANGLE MACHINING



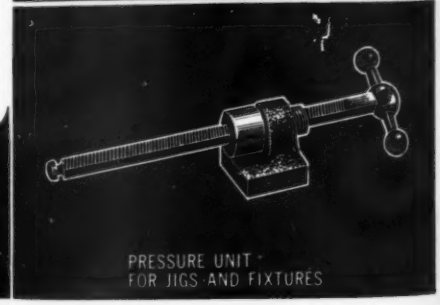
SPEEDI-SPACER
FOR FAST PRECISION INDEXING



ADJUSTABLE LATHE FIXTURES
SAVE SPECIAL TOOLING



QUICK ACTING VISES
FOR TOUGH OPERATIONS



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TOOLING & PRODUCTION
The Magazine of Metal Working Methods

Finally, the Quality Battle

WE HAVE HAD, and will always have, industrial price wars, but never before have we at one and the same time been so conscious of quality and reliability.

Probably it was inevitable, and in some instances it may be only a sales gimmick. Whatever the cause, the effect is noteworthy and it's comforting to buy when backed by a **solid** guarantee. For instance: The Moore Special Tool Co. has come out with a 10 yr guarantee on their No. 3 jig borer and their No. 3 jig grinder. The guarantee is impressive in that it spells out machine parameters in no uncertain terms — millionths.

We are thinking more and more of this degree of dimensional attainment when we talk quality.

With Moore, we are sure it's serious business. With the automotive industry we tongue-in-cheek the guarantee extension — but we are anxious and willing to be shown.

In certain instances the quality and reliability promises are suspicioned, but they do point up a trend in thinking and it's a healthy tread. And, assuming there is honesty behind all quality specs, which is certainly a fair assumption, the commitment is made. There is no turning back; once quality is achieved, it's "industricide" to offer less.

If you don't succeed in at least meeting the quality and/or reliability of a competitor you will perhaps cease to be a competitor.

This trend, its implications and its implementation, has perhaps been sponsored, or hurried, by aerospace developments. We are not concerned as to how it began, but we are concerned as to how you will figure in what's to be gained from it all. Consider the ideas in this issue and look for others here and elsewhere, that you may ride the crest of quality control.

William E. Hoffman
Editor

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CIRCLE INFORM-A-GRAM KEY NO. 40

TOOLING & PRODUCTION

The Magazine of Metal Working Methods

VOL. 27, No. 3
JUNE 1961

Quality Can Be Achieved Without Increasing Costs

A case history involving a typical manufacturing problem wherein the quality control engineer applies objective analytical methods to coordinate the effort of shop personnel, and thereby achieves improved quality with an actual cost reduction.

IT IS A COMMON misconception that improvements in quality are often accompanied by increased costs. Most quality control men know that in many instances it is possible, through application of objective analytical methods to manufacturing problems, to obtain increased quality with decreased cost and increased production. The following narrative is a case history of such a concerted attack on one manufacturing problem which gave this result.

The basic problem involved the difficulty encountered when tapping holes of the smaller machine-screw sizes. The smaller the diameter of the tap, the greater the problems encountered in tapping. The quality of the tapped hole is sometimes sacrificed to prevent excessive tap breakage.

Such was the case uncovered by the quality control engineer when investigating complaints from the assembly division that the smaller machine screws were stripping out when tightened to torque requirements. The apparent cause was that the percentage of thread height in the tapped hole was not sufficient to hold when stressed to the required torque values.

When the foreman of the fabrication division was confronted with the complaint, he was willing to do whatever possible to eliminate or alleviate the condition. However, he also had problems. How could he maintain 75 to 80% thread height without breaking taps? How could he maintain production while his setup men were constantly changing taps because they were not cutting to size? The entire problem was now beginning to take shape. Not only was there a quality problem at assembly, but also another quality problem in fabrication. Some careful fact-finding would have to be undertaken to arrive at a solution that would satisfy both divisions.

The old adage that "two heads are better than one" was employed as the first step in the fact-finding process. The fabrication foreman, the setup man and the quality control engineer got together and discussed possible solutions to the problem. This initial session brought more facts to light. The setup man had been complaining for some time that the poor condition of the holes prior to tapping was the chief reason for excessive tap breakage, and since he had been unable to obtain results by complaining, had been forced to re-size entire lots. (This re-sizing operation sometimes resulted in oversize holes.)

The specific condition referred

by Ralph B. Nottingham
Director of Quality Control

and James E. Ralph
Quality Control Engineer

North Electric Company
Galion, Ohio

to by the setup man was the condition generally found when holes are pierced and countersunk in a die; i.e., a work-hardened and undersize portion of the hole at the intersection of the countersink and the straight wall. Also, the setup man had complained of inadequate fixtures for holding the workpiece during the tapping operation. Temporary tooling, designed for short run production that satisfied the immediate need rather than the demands of every day production, was still being used. Consequently, the tapped hole pitch diameter tolerances were difficult to maintain.

The material being tapped was also listed as a source of trouble, since it was mostly magnetic iron. Unfortunately, this material has to be used because of its magnetic properties regardless of its machinability, and this normally results in a short tap life.

The Answers

The first step was to improve fixturing and the lineup of the hole and tap. This was accomplished by pointing out to the tool engineer that the temporary tooling he had hastily devised (and subsequently forgotten) was still being called upon to answer the ever increasing demand of current production requirements. Now that urgency was not the immediate problem, the tool engineer came to the rescue and designed tooling for quantity as well as quality. The tooling had to be revamped on a priority basis, and therefore expected improvements would be gradual.

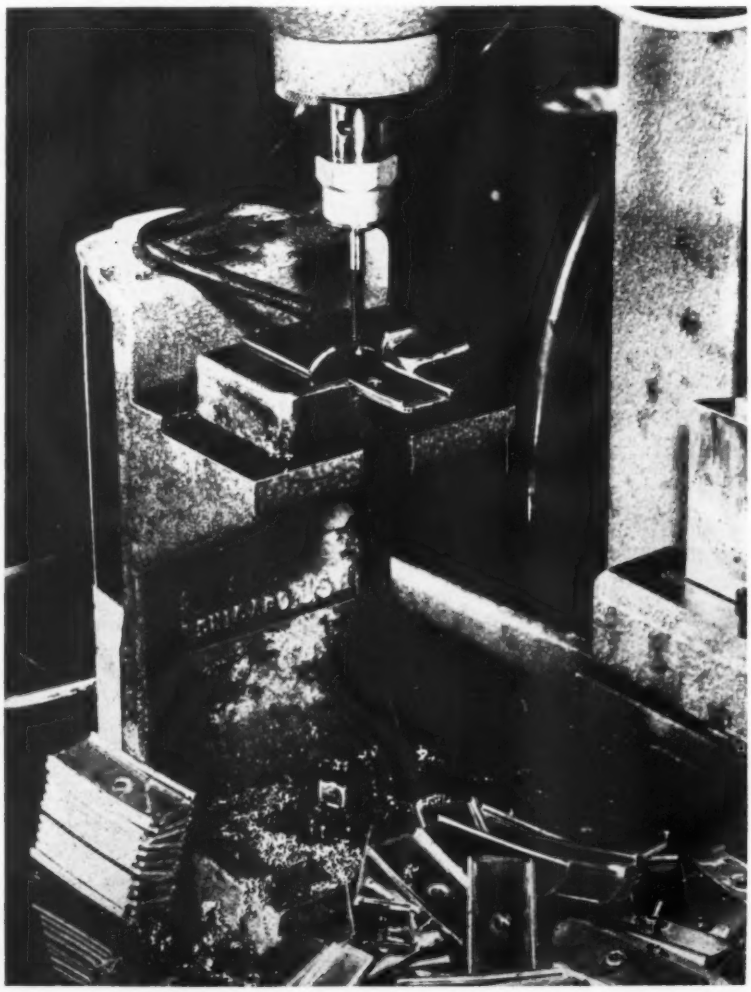
The second step was to set up a system for recording the number of holes per tap in order to evaluate any improvements. Another condition agreed upon was that all tapped holes would now have to pass not only the class 2B Go thread plug gage, but also not accept the 2B No Go gage. And in no instance would a hole size be allowed that would not give a minimum of 50% thread height.

The results of this initial action showed that the pitch diameter was difficult to maintain, since there were quite a few holes that would still accept the No Go gage. Tap breakage was also high, as the records indicated an average of only 2000 holes per tap.

Not to be discouraged, the team composed of the foreman, setup man, tool engineer, and quality control engineer tackled the problem anew. During this meeting, a fluteless tap was suggested instead of the normal two-fluted tap that was being used. The reasoning behind this suggestion seemed logical. The only reason for cutting flutes in the tap is to break up and dispose of the chips formed while tapping. Since the holes were through holes in most cases, the chips could be pushed ahead of the tap instead of being brought back up through the flutes. The fluteless tap with its uninterrupted teeth should offer closer control of pitch diameter.

It should also be stronger, since it isn't weakened by cutting away the body to form flutes. With all in agreement, the use of a fluteless tap was chosen as our next course of action.

When tapping a short through hole, the relatively few chips are driven ahead of a fluteless tap. The short hole (few threads) permits a smaller drilled hole and this, in turn, results in a stronger (more fully formed) thread.



Results

The results were very satisfactory. Pitch diameter control was obtained, meaning there were no occurrences where the tapped hole would accept the No Go gage. The number of holes per tap increased

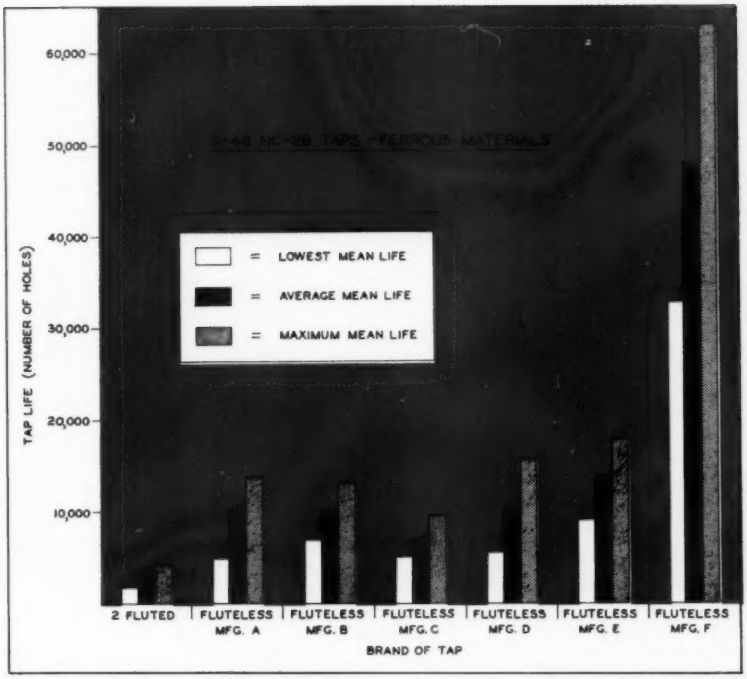
to an average of 12,000. Because the fluteless tap proved stronger than the two-fluted tap, we were able to reduce the hole size in our workpieces and thus able to provide 55 to 65% thread height.

Since the results obtained from the second experiment were so satisfactory, the enthusiasm of the production foreman and setup man spurred them on. They thought that taps obtained from different tap manufacturers, or taps with various types of surface treatment might offer further rewards. So taps were obtained from several tap manufacturers to be subjected to the new test. There are numerous variables in an experiment of this type, such as different workpieces, the workpiece material, the type of tapping machine, and the operator who will perform the operation.

It was decided that all taps would be subjected to the same conditions, and would be selected without regard to material condition, workpiece, machine, or operator. In other words, the part to be tapped could be ferrous or nonferrous, any machine could be used, and with any operator. The only variable that would be controlled would be the type of tap used. Data was then recorded for each tap listing the number of holes produced without exceeding the Go and No Go limits of the thread gages.

Since we expected different results from ferrous and nonferrous materials, the type of material tapped was recorded. The reason for failure was also recorded. Did the tap break due to fatigue or did it break due to fixture misalignment? Was it due to operator difficulty or due to a defective hole?

The results of our experiment are shown on the accompanying data sheet. It can be seen that manufacturer "F" shows a significant difference. Only the tap mean life has been plotted on the data sheet. This is done so that there can always be unusual results recorded; i.e., a tap failure with only one or two holes tapped, or a tap failure after an unusually high number of holes have been tapped. However, if we study the mean life of the tap, we can disregard these extraneous recordings and predict that if we were to conduct similar tests on similar taps, we should expect similar results within 95% confidence limits.



Much testing and experimentation paved the way for the adoption of the fluteless tap. One objective related to sources of supply. This chart shows the results of life tests run on taps from six suppliers.

The history on the 3-48 taps was chosen for illustration since this tap was most representative of the problem. The results for other sizes of taps and for tap life in nonferrous materials were comparable but are not shown due to space limitation.

Recording Continued

To satisfy ourselves that we did have the answer to our tapping problem, we continued our records. This record keeping provides a control chart for our tap usage, and should give a warning signal as to the condition of our fixtures. Extensive tap life is now expected, and if a tap fails after producing only a few thousand holes, the operators, setup men and foremen are quick to ascertain the reason.

Summarizing the results obtained from our experiments conducted to control the tap problem: The pitch diameter of the tapped hole was so greatly improved as to meet the Unified Thread System of Go and No Go thread gaging. The reduction in the hole size gave stronger threads and reduced thread-stripping at assembly. This improved the quality of our product. The increased tap life resulted in increased production at a lower cost. Finally, the operators were very happy about their results with the new tap because they were able to make rates they previously had thought excessive. Above all, it shows what can be done by teamwork.

As is the case in most problems of this sort, a lack of communication was really the reason for the problem existing in the first place. The quality control engineer stepped in as liaison between the shop, the purchasing department and the toolroom. Through the use of fact-finding and controlled experiments, he was able to implement the things shop personnel had believed possible from the outset. ■

How To Set Up For

An Off-Set Taper

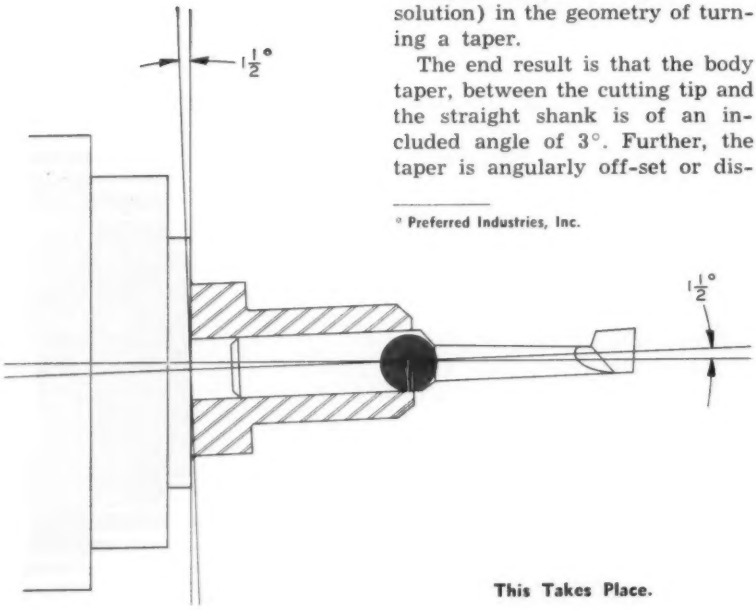
THE PRODUCTION OF THE BORITE* boring tool presents a neat problem (and an equally neat solution) in the geometry of turning a taper.

The end result is that the body taper, between the cutting tip and the straight shank is of an included angle of 3°. Further, the taper is angularly off-set or displaced so that one side of the taper is straight and parallel in relation to the shank.

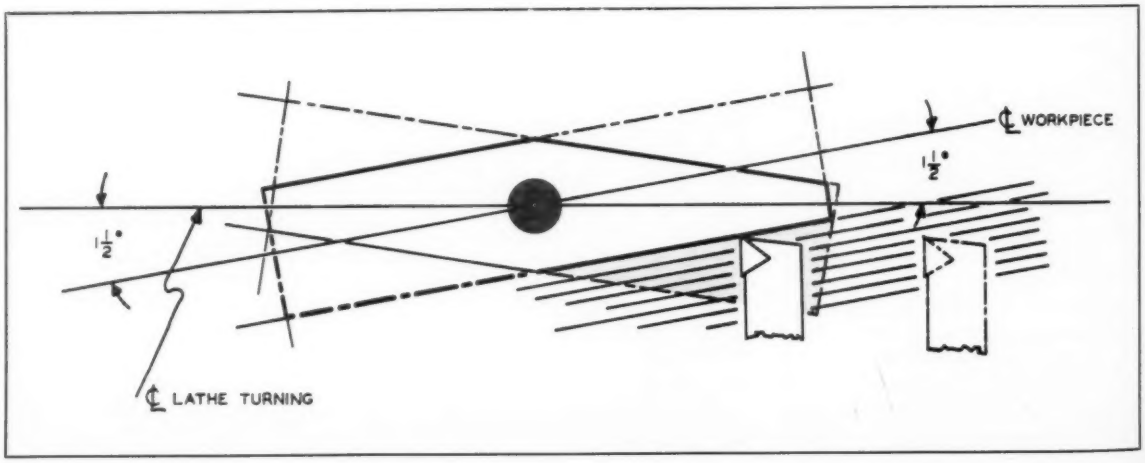
These conditions are met by the combined workings of the lathe's taper attachment being set for a taper of 1½°. The workholding fixture devised by Nolan Tooling, Inc., holds the workpiece at a 1½° angle to the spindle center of rotation.

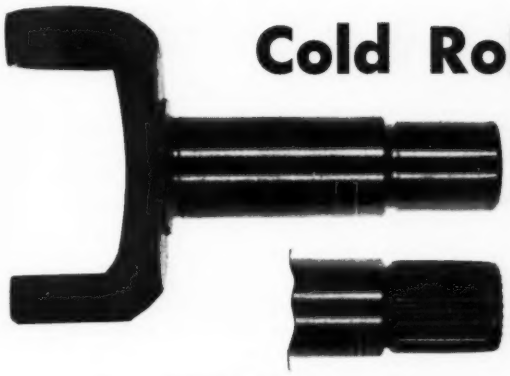
This setup means that the workpiece wobbles about the center of rotation. Successive cuts are taken and a final cone is generated as of the last pass. Its centerline has become common with the lathe turning axis. This provides adequate clearance as the cutting tip feeds into the work while boring and the cone shape provides adequate strength and tool rigidity. ■

* Preferred Industries, Inc.



This Takes Place.





Cold Rolling Answers Design Change Demands

by Lawrence J. Curran
Assistant Editor

Fig. 1 Universal joint yoke shaft before (top) and after spline rolling.

A PRODUCTION CHANGE to accommodate the design of a new compact car part has introduced a major auto maker to a different way to produce splines. Though cold rolling of serrations and splines has been around for a number of years, it involved a departure from hobbing 2 yrs ago at this Cleveland facility.

The part is a universal joint yoke shaft, Fig. 1, one of which goes on each side of the differential of this new auto. It calls for 25 involute splines on each shaft, each with a 30° pressure angle, and 24/48 diametral pitch. The splines are about 1 5/16" long, running up close to the yoke shoulder.

The part had never been produced before this new compact model was introduced. Similar yoke splines for larger passenger cars are hobbed by this producer, but a hob would gouge the yoke shoulder in finishing a spline so close to it, even though the shaft is undercut at the shoulder.

Though the spline-forming racks can move metal as close as 1/16" to the shoulder, undercutting is still necessary to protect these costly tools. The flat racks are the business end of a Model 3225 Roto-Flo machine made by Michigan Tool Co. They cost more than $1200/pair, and are reground for about half that figure. Engineers at the Cleveland plant say the racks form about 80,000 splined parts before they are shipped back to Michigan Tool for grinding. Each pair can be reground three times.

The M-2 HSS forming racks roll the part about its own axis as they move in opposite directions to generate splines. Headstock and tailstock centers lock the part as they enter center drilled locations in each end of the yoke shaft. This action takes place after the operator has manually loaded the part through a guide bushing that aligns it with the centers. Floor-to-floor time at this forming station is roughly 10 sec.

This U-joint component comes to the Cleveland plant as an AISI 1035 (optional 1038) normalized

Fig. 2 Partially generated splines at mid-point in cold rolling. Note closeness of forming racks to yoke shaft shoulder.

Fig. 4 Fully generated splines are apparent after forming racks have completed their pass.

steel forging with a hardness reading of R_B90 (equivalent to approx. R_C10). Before it reaches the spline rolling station, both sides of its lugs are broached, its cross holes are drilled, reamed and pull-broached, spots for headstock and tailstock locating in the Roto-Flo machine are center drilled, the shank is turned on a tracer lathe, and finally rough ground just before spline rolling.

Fig. 3 Tailstock center secures yoke shaft in guide bushing. This is an early stage in rolling operation.

But it's the cold-rolling operation that has production planners on this job smiling. Since they got their first Roto-Flo machine about 2 yrs ago, they've had virtually no maintenance problems with it and a twin they later secured. The senior engineer says they produce twice as many parts on the Roto-Flo machine as could be done in the same amount of time on a rotary hob, and he stresses that this is a conservative estimate.

A close look at the forming racks in the Michigan Tool machine reveals that their teeth are shallow at the end which first contacts the workpiece. They get deeper over the rack's 24″ length. This design results in a bite that's moderate at first, then progressively displaces more metal as the part is rotated several times until the splines assume their full form.

The actual forming run probably requires less than 4 sec. The loader retracts the part, and the hydraulically driven racks automatically return to the starting position. During the return cycle, the operator removes the finished piece, and loads a new one. After splines are formed, the shaft is induction hardened and drawn to a surface hardness of R_C48 to 52, finish ground, given a phosphate anti-friction coating, and finally assembled into a complete joint. ■

New Reliability Program

More stringent military requirements for reliability of electronic parts will increase costs to producers, but the rise may be offset by increased yield and greater reliability of equipment. That's what Paul S. Darnell, chairman of the military-industry study group which prepared the report on Parts Specifications Management for Reliability (PSMR), recently told members of the Electronic Industries Assn.

Discussing the impact of the PSMR report, which recommends ways for specifying the reliability of electronic component parts in military contracts, Mr. Darnell said the producer of electronic parts would be charged with demonstrating the capabilities of his products to equipment contractors and government inspectors.

"With the intensification of military inspection practices, and the addition of definite reliability level requirements to specifications, parts producers would be required . . . to do more testing and apply increased control in manufacture."

More testing will lead to higher costs, he said, but greater yield should "offset partially" the increases. In addition, major improvements in performance of military equipment will be accompanied by "significant reduction in equipment costs," he pointed out.

Mr. Darnell, director of military reliability engineering at Bell Telephone Laboratories, said his 56-man study group may not have "foreseen all the problems, and many will take issue with some of the recommendations." However, he said, these differences should be considered as points to be resolved and "not as loopholes through which to dodge the disciplines imposed by the implementation of these recommendations."

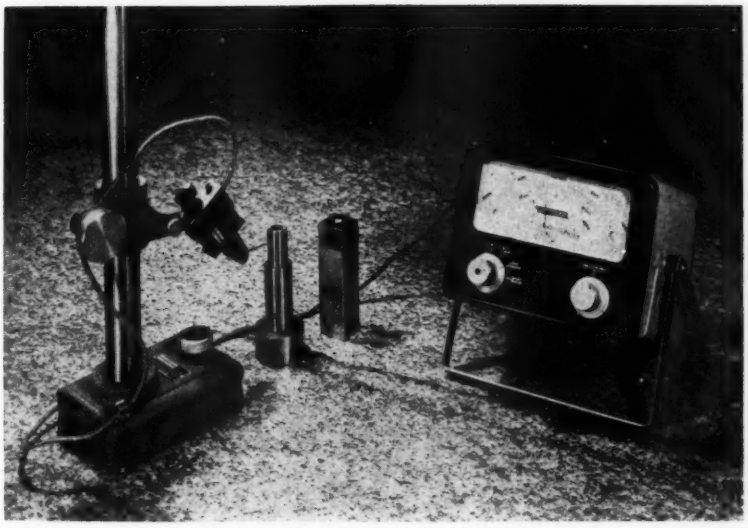


Fig. 1 Here is the type of application where transistor-operated gages lay claim to fame. In the care and feeding of surface plates and gage blocks, the heat radiated by power consuming vacuum tubes would be inimical to precision.

The Transistor Meets Up With Q-C

by E. Willard Pennington
Editorial Director

IN ANY FIELD of endeavor it is standard practice to pick the brains of other fields. Thus it doesn't take long for new technologies to spread from their original environs into other pastures.

The transistor is a perfect example. A development of the communications industry by Bell Telephone Laboratories, it has enjoyed an open-arm welcome in the quality control field. Here, in the electronic amplification of mechanical movements, it is replacing the long-entrenched vacuum tube — and for many good reasons.

The transistor is much smaller than a vacuum tube. It lends itself admirably to a reduction in bulk and weight of the auxiliary amplifying and voltage generating equipment essential to the newest designs in measuring and inspection equipment.

Carried to the ultimate, we now have battery-powered gaging equipment that is extremely portable and can be taken to the work or machine, unencumbered by having to be plugged in an outlet.

Transistor operated gages first appeared in 1958 with the advent of the portable, battery-powered, general purpose gage introduced by Federal Products Corp., Providence. Fig. 1 shows their latest.

The surface plate setup in Fig. 1 emphasizes another advantage of transistor equipment as compared to vacuum tube-equipped instruments. The transistor battery-powered amplifier is built into the meter housing.

Transistors operate at virtually room temperature whereas vacuum tubes are, in a sense, small electric furnaces doing a slow burn. As such, they have no business in the immediate proximity of a precision surface plate and stack of gage blocks. Even if the job exemplified by Fig. 1 involved a separate vacuum tube amplifier placed on the floor below the plate, the heat radiated due to the wattage consumption of a vacuum tube amplifier, with its complement of amplifier and voltage reg-

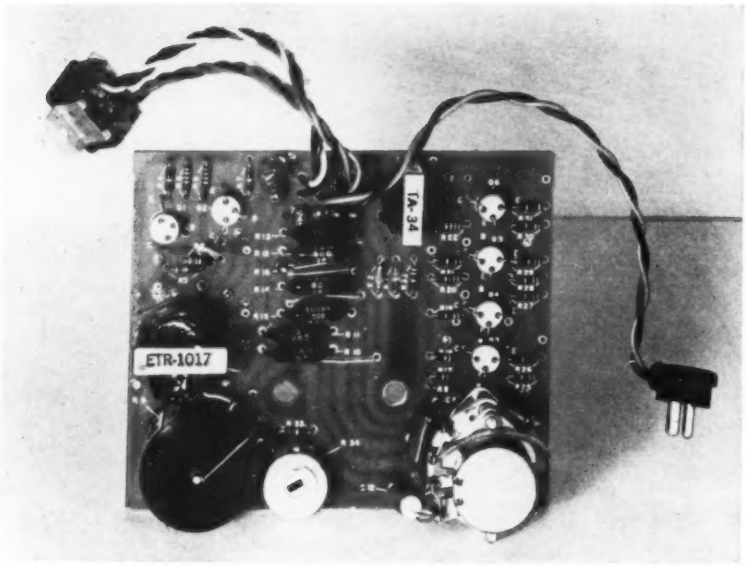
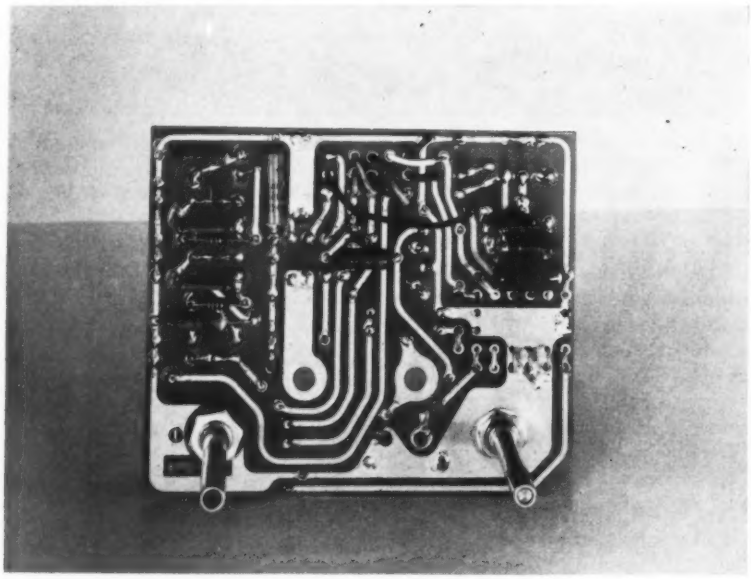


Fig. 2 (above) The miniature chassis of the gage shown in Fig. 1. The six transistors are no bulkier than their adjacent resistors.

Fig. 3 (below) The printed circuitry of the chassis presents the nth degree of miniaturization.



ulator tubes, would be a serious influence when we are striving to make repeat measurements in terms of millionths.

In a large, elaborately equipped gage standards laboratory, a profusion of vacuum tube "heaters" are a sometimes unsuspected influence. It is a common practice when working with vacuum tube electronics to turn the equipment on and wait for it to get up to operating (and radiating) temperature. Heat sources and millionths just don't mix!

Manufacturers of transistor-powered gaging equipment have other dividends to pass along to their users — reliability and reduced maintenance costs.

First of all, you obtain greater reliability because transistors outlive vacuum tubes by as much as 20 to 1, and in some cases even more. Transistor operated gages reduce maintenance problems because the lower power requirements, coupled with the almost complete absence of heat generated, greatly reduce the probable need for repair.

This is particularly important where you have no personnel adequately trained to repair electronic equipment, and you must rely on outside services.

The internal chassis of the gage shown in Fig. 1 is shown in Fig. 2. This shows the miniature size of all components, and the six transistors are readily discernible. The underside of the chassis employs the printed circuitry of Fig. 3.

The first transistorized machine control gaging unit is shown in Fig. 4. The Arnold Gage calipers the work while it is being ground. Mechanical movement of the sensitive contact actuates an AirProbe at the top of the gage. The AirProbe transforms the mechanical movement into a change in air pressure. Changes in air pressure actuates both the meter on the air electric unit and the switches within the meter. The precision switching utilizes the transistor circuitry to work handling relays which, in turn, retract the grinding wheel when the workpiece reaches finish size.

The gage buyer, generally speaking, can expect to get more for his electronic gage dollar when he purchases transistor operated gages.

The absence of voltage regulating circuitry, power handling transformers, associated compopents (rectifiers, capacitors, resistors, etc.) substantially reduce the amount of equipment that has to be supplied and, therefore, the selling price. And coupled with that is the lower operational cost because of the higher reliability.

Transistors have their limitations, but they are not particularly serious or pertinent to most gaging applications. The tendency is for transistor characteristics to

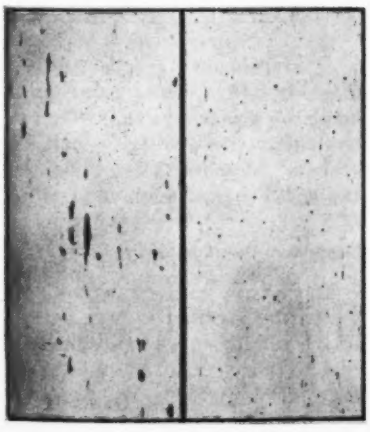
Fig. 4 The first transistorized machine control gaging unit. The grinding wheel retracts when the workpiece reaches finish size.

change appreciably where temperatures rise above 120 to 150F. This poses a problem in any equipment which would be operating under conditions too severe for human endurance. It is very unlikely that any of the gages used today are subject to this type of environment. ■

Freer Machining And Better Corrosion Resistance

How can you retain the free machining of a 303 stainless steel without the adverse side effects of high sulphur content? Universal-Cyclops Steel Corp. has come up with an answer in their new Uniloy 303-MA, which combines aluminum with sulphur additions to provide a superior microstructure.

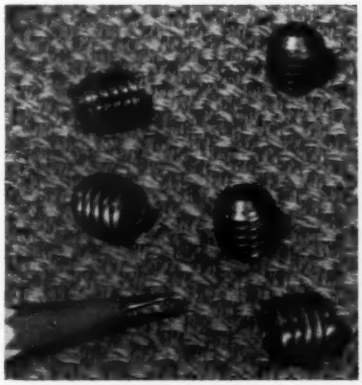
The unique combination of aluminum and sulphur additions in Uniloy 303MA (right) results in a much cleaner steel than AISI 303 (left). At 100X, these photomicrographs illustrate the difference that accounts for the high performance of the new alloy.



The sulphur content as conventionally used to provide a free machining quality tends to form non-metallic stringers and inclusions. These constitute a limiting factor on certain applications, especially where cold working is required. Sulphur inclusions also cause loss of lustre and of corrosion resistance. In contrast, the lower sulphur content of the new alloy is more finely dispersed and does not present these same adverse effects.

Machinability of the new chromium-nickel stainless steel has been greatly improved over the regular AISI 303 materials. In one full-fledged customer testing of the alloy under actual production conditions, the automatic screw machine time for producing locknuts was reduced from 28 sec to 20 sec. In another tough slotting operation, saw sharpening costs were cut 50% because of longer tool life when machining 303MA instead of AISI 303.

In boiling nitric acid, the new alloy is 30 times more resistant to corrosion than Type 303 and approaches Type 304. Thus, the material often can be substituted for 304 in corrosive environments to benefit from lower unit costs.



These threads were successfully rolled on 303MA, giving excellent surface finish and substantial savings in threading costs. The conventional 303 stainless behaves poorly in roll threading and other cold working processes.

The alloy exhibits greater yield strength than 303, can be cold worked, resists longitudinal splitting, and develops a very high lustre.

The unique combination of qualities indicates a degree of superiority for the new alloy that will make it a favorite of both design departments and machine shops, and of end customers as well. For literature on Uniloy 303MA, write to Universal-Cyclops Steel Corp., Bridgeville, Pa., or circle Inform-A-Gram No. D1.

Machine Replacement For The Shop Manager

Chapter V - Formulas Shouldn't Make Decisions

THE BIGGEST DANGER from replacement formulas is that the arithmetical answer to the calculation will become, automatically, the "buy" or "don't buy" decision. In entirely too many instances we select without question the machines yielding the greatest "return." We substitute formula cranking for judgment, and forfeit our right of management decision to the "decision" of the calculation.

Depending upon which formula we're using, the answer to a replacement calculation will be expressed in one of several ways. We'll get "rate of return," "number of years to 'pay off'," "MAPI urgency rating" or some similar indication of the relative earnings from the new machine. But we shouldn't select the highest return **machine investment,** without regard to other facts, any more than we should select **any other investment** just because it showed an attractive return. The degree of risk in the investment, the human factors, possible expanded capacity, all have to be considered, and aren't by the formula.

by Baxter T. Fullerton

Mr. Fullerton is Director of Marketing Services, The Warner & Swasey Company, Cleveland, Ohio

Different Degrees Of Risk

An investment in industrial bonds today will yield from 4% to 8%. Why these different yields? Because of the different degrees of risk that the bond may or may not continue to pay. There are also different degrees of risk that machine tool investments will or will not continue to pay.

Here's a typical risk situation. We can buy a new general purpose machine tool to go into a department with several others of the same general size and type. We're now operating one shift, and we expect to make annual savings of $4,000.

If our business goes down 25%, the shop will continue to operate its best facilities. The **new machine** will run full time, while some of the older ones will be idle. Our savings will remain at $4,000, or close to it.

If our business goes up 25%, and we have to go to a partial second shift, the **new machine** will run during the second shift and the older ones will remain on one shift. Our savings will become $8,000.

Now consider a different machine in the same circumstances. We can buy a special purpose machine limited to several specific jobs and obtain the same $4,000 saving. If our business goes down 25%, the machine can run only 75% as much as planned. Our savings will be $3,000. If our business goes up 25%, we will run this machine ¼ time on second shift and save $5,000.

Our savings with the general purpose tool will be $4,000 or $8,000; with the special purpose tool $3,000 or $5,000. With an even chance of business going up or down, the **probable** earnings of the general purpose machine will be $6,000 and of the special purpose $4,000.

There's a big difference in the worth of these investments, a difference that the formula has not taken into account!

And this isn't the only difference. The specific jobs for which the special purpose machine was purchased may disappear through a change in product design or in the market for that product. Most shops have their idle white elephant that is only adaptable to no longer existing work. The versatility of a machine, its ability to handle work we don't even know about today, has a considerable influence on its investment value.

There's nothing new about this. Companies have often bought general purpose tools for an application even if a special purpose machine was cheaper or faster on that particular job. The problem is that we forget to apply the same common sense to the answers of our replacement calculations.

As investments, general purpose machine tools are the government bonds of a machine shop. We can buy them with as little as half the "return" we expect from some specialized pieces of equipment.

Shops Are Run By Human Beings

There are other factors for which the formula answer doesn't account. Shops aren't run by automatons, they're run by human beings with emotions and feelings.

There may be some foremen and some operators who respond well to the challenge of continuing to turn out good work on wornout machines. Most of us, though, will do better work if every so often we have new equipment to work with as evidence that the boss is sympathetic to our needs.

An entire department can be stimulated by new machinery. On the other hand, many foremen are human enough to stop asking for new machines — and stop looking for other metal-cutting improvements — if management pays little attention to their requests.

It follows, then, that with several departments and many new equipment needs, it may be advisable to do **something** for each department. A replacement yielding little apparent "return" might be a good investment for what it will do to department morale and over-all productivity.

There's an additional problem to face at the departmental level. Machining standards and job scheduling in a machine center may be such that it's impractical to introduce new standards for **one** new machine. In these cases it may be better to replace an **entire** machine center than to pick away here and there at only investments showing the greatest "return." Or you may want to begin replacing machines in a department knowing full well that the full advantage of this replacement will not be felt until enough machines have been replaced so that standards can be changed.

The formulas won't give us the answers to these problems. They give us only a partial answer that can be helpful in arriving at a management decision.

In addition, there are replacement situations that just don't lend themselves to a calculation.

Toolroom & Maintenance Machines

Toolroom and maintenance machines are a good example. How can we ever show enough savings to justify replacing a machine that may only run 10 hrs/wk? We can't. We know that there's value in having toolroom machines capable of accurate work, and if they're not capable they should be replaced. We know that it is not as important for the machine to be highly productive as it would be if it were on the production floor. But how productive should it be? What is the value in having a toolroom equipped for making a certain fixture in three days rather than six days? It may be very little in fixture cost, but considerable in the ability to meet an important shipping deadline.

Several years ago the maintenance shop of an oil refinery installed a new saddle type turret lathe. While the machine was being demonstrated, a rush job on a large broken sleeve came into the shop. A substantial part of the refinery was inoperative until a replacement sleeve could be made. The new machine came to the rescue by producing within an hour a new sleeve that would previously have required several hours' machining. The refinery people told us that through saving several hours of refinery downtime, the new machine had more than half paid for itself before we were through demonstrating!

It would have taken a clairvoyant to foresee this freak situation in a replacement calculation. Since **most of us don't lay claim to clairvoyancy,** we should **judge** the replacement of toolroom and maintenance machines, and not try to calculate it.

"Elephant" Machines

Another situation that cannot be handled conventionally is the replacement of large, heavy — and expensive — "elephant" machine tools. As discussed in Chapter IV, it's difficult to come up with enough dollar savings on a man-hour basis alone to **ever** replace a $100,000 or $200,000 piece of equipment. If you follow only the cost saving answers of your formula, you may keep the big machines until they have lost their capacity to stay up with production, or perhaps until you're unable to produce certain pieces on them. Capacity is a particularly important problem with big machines. If you have insufficient screw machine capacity, you can subcontract your excess work fairly easily. It is far more difficult, though, and often completely impractical, to subcontract much of your big work.

". . . most of us don't lay claim to clairvoyancy."

The need in big machines, then, is a combination of low cost production and just plain capacity to produce. Theoretically, we can express this need by dollars and cents in a replacement calculation, but it is not easy to express the capacity factor in a formula. It is usually better to let the formula express the cost saving aspects of replacement, and apply afterwards a liberal sprinkling of judgment on capacity. If capacity is a problem, you should replace "elephant" machines on a much lower apparent return.

"Replacement" Can Be "Expansion"

As a matter of fact, replacement of smaller machines can have a capacity advantage as well. We don't always sell or trade old machines when we've "replaced" them. If we have ample floor space, we keep them around for simple and overflow jobs. When our shop gets real busy we find that they're working full time again. One expanding shop "replaced" the same machine several years in a row by this process — and perfectly properly.

If we physically discard the "replaced" machine, the return shown by our calculation is the whole story. If we keep the old machine around because we might need the capacity, there may be additional

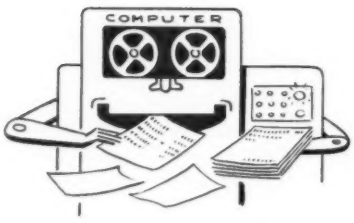
benefits to the replacement that the calculations don't show.

How Much Are These Factors Worth?

To recognize the factors unaccounted for by formula — degree of risk, the human element, possible expansion — and to recognize cases which the formulas can't solve, is much easier than it is to know **how much to account for them in replacement decisions.** It's because these factors are so difficult, and sometimes impossible, to express mathematically that they belong **outside** rather than inside the calculation.

This is not a new problem. Business judgment always requires weighing factors that can't be expressed mathematically. And perhaps it's just as well, **otherwise our jobs could be handled by computers.**

Assuming that our best judgment has gone into the calculations, (Chapter II, III, & IV) they give us at least, a starting place. In any one case, the question then becomes, "How much should we alter the answer to allow for the unexpressed factors?" No one can pre-judge this and no two cases will be alike. I'm firmly convinced of this, though; if you're comparing two possibilities, one with all of



". . . otherwise our jobs could be handled by computers."

the "judgment" factors in its favor and the other with all of these factors against it, you should alter the calculated answer by three or four to one! A general purpose machine tool going into a department where you know it will be a big shot in the arm for the foreman, and where there may be need for additional capacity could be a better buy at 6% "return" than another machine returning 24% but with none of these things in its favor. Somewhere within a range as great as this is the correct answer to any one case.

You Must Supply Perspective

If you agree with this reasoning — in principle, or in part — the last question is how to get it across to the people who have the final say on replacement purchases. This is essential, especially in the many companies that have set up the rigid "pay-back" requirements that give the calculation itself the "buy" or "don't buy" decision.

Once again, this is a problem that is easy to recognize and hard to solve! I have no pat answer. One suggestion — expose these people to your thinking in all ways you can. Don't submit for approval only those cases that can "prove in" by the set criterion. If you submit an annual budget, include in that budget the purchases you want to make in **your own** order of preference. Take into account earnings the calculations show and your own judgment on the factors the calculations can't reflect. Accompany this with a brief explanation where your preference does not follow the calculation.

If this accomplishes nothing else, at least whoever approves or disapproves will have to **consciously** pass over some of your selections in favor of others. Thus the decision won't be made by default, as is now too often the case.

More important, it might contribute to understanding and proper perspective. Until this perspective is achieved, replacement formulas will continue to be unintentional road blocks to replacement. ■

Combating Recessive Tendencies

A champion of aggressive optimism during difficult periods of the metalworking industry, T. Laurence Strimple, president of Cleveland's National Acme Co. said recently: "Combating recessive tendencies and foreign competition is a matter of meeting them both head-on with better and more efficient methods and techniques."

He pointed out that though many overseas countries are undergoing a crash program to improve the quality and quantity of their products in order to compete more vigorously with U.S. industry, export sales accounted for a substantial share of his company's 31.6% increase in sales during 1960.

"The healthy competitive spirit that built U.S. industry, based on both quality and price, creates an opportunity for American business to compete on its own terms.

"Each of our travelers reported that U.S. industry still has a very decided edge on tooling and machining methods. There are no machine tools in the world that combine as high a repeatability factor with as low downtime as those designed and built here. Engineering ingenuity is still the hallmark of American manufacturing.

"That is why, now that we have the opportunity to compete on our own terms, we are in a better position to stay ahead.

"Foreign manufacturers increasingly are demanding the very latest in the way of highly automated precision tools. To combat this, we must get full return from our working force and make wider use of highly automated equipment in our plants. This is an urgent project for both management and labor."

The National Acme Co. is one of the most active machine tool builders in the world market. In addition to utilizing U.S. sales and service personnel for liaison with overseas customers, the company licenses B.S.A. Tools, Ltd., England, and Pittler Maschinenfabrik, West Germany.

Despite the role that overseas business played in National Acme's sales for last year, Strimple noted that there has been considerable upturn in domestic inquiries lately. Some inquiries show evidence of "pressure buying" to increase precision and cut costs.

WHO SAVES WITH THE A-L TOOL STEEL STEELECTOR SYSTEM?

EVERYBODY DOES!

If part of your job deals with tool steel, you can save time and make your work easier by using the Allegheny Ludlum STEELECTOR System. And you will be saving your company money. Check this list to see how the STEELECTOR Program can help you:

Owner, president, vice president Reduces costs in warehousing and purchasing. Insures selection of the right tool steel—prevents misapplication and wrong heat treatment.

Operating man, superintendent, foreman, production control man Ends availability problems. Large local warehouse stocks enable you to reduce your own stocks. Consistent high quality.

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Heat treater Helps you operate furnaces more profitably—more tools can be treated at a time.

Purchasing agent Reduces paperwork and inventory needs. Makes your job easier.

For more information ask your Allegheny Ludlum salesman for your copy of the colorful STEELECTOR Booklet, or write: *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. TP-6-1.*

3242

STEELECTOR PROGRAM

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

CIRCLE INFORM-A-GRAM KEY NO. 53

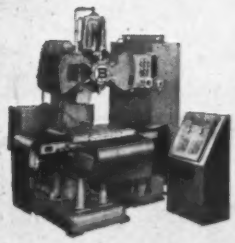
10 COST REDUCING FEATURES OF Burgmaster

ACCURATE

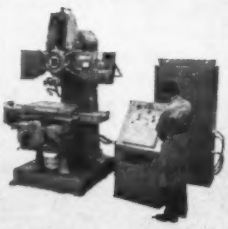
RIGID

FAST

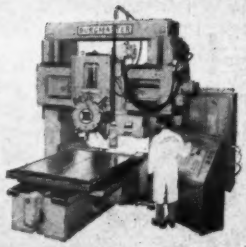
MODEL 3BHT
8-spindle, 1½" capacity in steel. Table travel 20 x 30, 30 x 45.



MODEL 2BHT
6-spindle, ¾" capacity in steel. Table travel 10 x 18, 15 x 26, 20 x 30.



BURGMASTER MODEL 25AHT
6-spindle, 1¼" capacity in steel. Table travel 15 x 26, 20 x 30, 30 x 45.



MODEL 3BHT-B DOUBLE HOUSING, PLANER TYPE
8-spindle, 1½" capacity in steel. Table travel 48 x 60

TAPE-CONTROLLED

World's Largest Builder of Turret Drilling Machines

TURRET DRILLING MACHINES

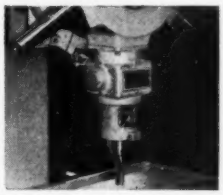
1 MACHINE RIGIDITY

Burgmaster components are well proportioned stable Moly Iron castings engineered with proper wall thickness, and extensive internal ribbing in the right places to provide the rigidity and stability required.

2 TURRET CLAMP RING

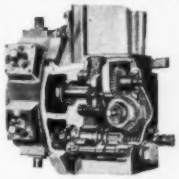
Increased accuracy is provided for heavy machining operations because turret is rigidly held against the face of the slide and securely clamped by an automatic acting "V" type external clamping ring.

3 LEAD SCREW TAPPER



The Burgmaster Lead Screw Tapping Head greatly improves the finish and accuracy of tapped threads and eliminates scrap due to pulled or loose threads. Capacities range from ¼" to 1⅛" in steel.

4 FOOL PROOF, ACCURATE TURRET INDEX



through Geneva mechanism with shot bolt locator and turret clamp assure .0004" TIR Index accuracy one spindle to another.

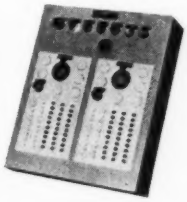
5 RUGGED SPINDLES

mounted in sets of reloaded double and single row, ball bearings, or Timken Roller Bearings assure minimum runout (.0004" TIR max.).

6 CONTROL STATION MOUNTED DEPTH STOP DRUM

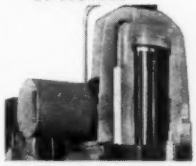
For setting depth stops and rapid traverse, lengths are located at the operator's control station within easy handling distance for convenience and speed in making set-ups. (60" from floor on 3BHT).

7 10 TAPE CONTROL SYSTEMS



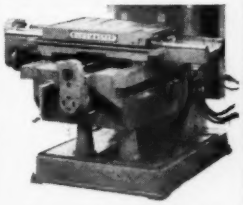
Ten different tape control systems are available with Burgmaster Turret Drills. This represents more systems than have been applied to any other drilling machines. In addition, more Burgmasters are tape controlled than any other type or make of machine.

8 MILL FUNCTION — RECIPROCATING DEEP HOLE DRILLING 3 AXIS CONTROL — OPTIONAL



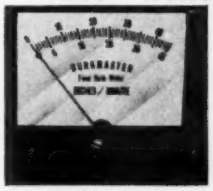
1. Burgmaster 3BHT tape controlled turret drills are rugged enough for milling cuts.
2. Reciprocating feed modification permits deep hole drilling with fine finish.
3. 3 axis tape control provides automatic depth control or circular table control — speeds setup, increases machine versatility.

9 HEAVY TABLE FULL WAY SUPPORT



Burgmaster tables are mounted on extra deep carriages, and the ways are twice the length of table travel in both X and Y motions with no table overhang. Tables are supported by double, synchronized, single crank operated, jack screws to eliminate deflection under load. Larger tables have four jacks.

10 PRE-SELECTIVE SPINDLE FEEDS — SPEEDS



Pre-selective feeds are infinitely variable from ¼" to 50" per minute, automatically pressure and temperature compensated which assures constant feed rates, as indicated on Feed Rate Meter at all times.

PRE-SELECTIVE SPEEDS

A wide range of 12, 24, or 32 speeds provide the right rate for most efficient machining and long tool life.

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SEND FOR LITERATURE

Write for bulletin describing Burgmaster 6 and 8 Spindle Tape Controlled Turret Drilling, Tapping and Boring Machines. Forty minute 16 mm sound film showing all Burgmaster Turret Drills in operation is available without charge from any office.

CIRCLE INFORM-A-GRAM KEY NO. 55

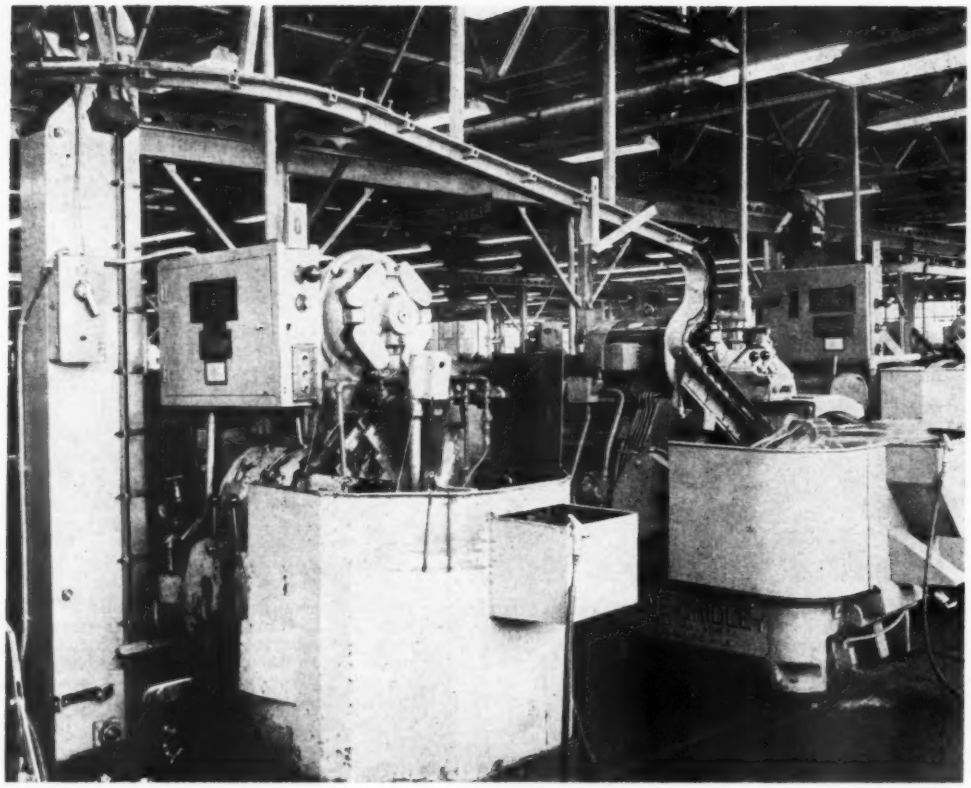


Fig. 1 The two machine setup with the single spindle screw machine on the left and the automatic chucker on the right. The magnetic elevator at the left has an electric eye at the top that controls the flow of parts to the conveyor leading to the second machine. The width of the conveyor is adjustable to accommodate different sizes of workpieces.

Mechanized Production Lowers Costs. . . Ups Quality

MECHANICAL HANDLING of double cups between two machining operations at the Timken Roller Bearing Company has resulted in a reduction of costs and handling time and has permitted closer product tolerances. The flow of pieces between two machines, a 3⅛" single spindle automatic screw machine performing 10 cutting operations and a 12" Chuckmatic, completing the last two cuts, is controlled by a system of electric eyes, product chutes and magnetic elevators. The setup requires less attention from the operator, permitting him to oversee a greater number of machines in the department. Briefly, here's how the machines and conveyor system work:

A red light on the single spindle screw machine signals to the operator that stock has been depleted, and the machine stops with

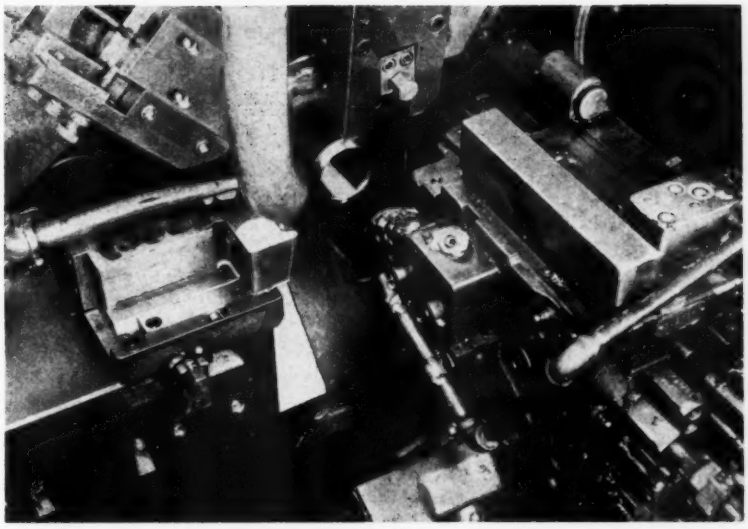


Fig. 2 This closeup of the working end of the single spindle screw machine shows the tool slides and the seamless tubing stock protruding from the collet. All tooling is carbide and is preset in the tool cribs.

the collet open. He retracts the stock stop, removes the butt end of the tube, repositions the stock stop and moves the ram feed to the back position. Next he releases a tube from the stock rack into the ram feed; the ram pushes the tube against the stock stop and the forming operation begins. Ten carbide tools combined on four tool slides complete the first steps. Three separate tools on the longitudinal slide bore the inside diameter, turn the outside diameter and chamfer. The breakdown tool slide moves in at a diagonal from below the piece and leads the cutoff tool by 0.027"-0.031". Tools on the cross slide turn the face, the radius, the front and back faces, and the groove on the outside diameter. As the breakdown and cutoff tools complete their cycle, a pickoff pin rises until its point is in the bore of the cup. The cutoff cup slides down the pin and the pin retracts permitting the cup to roll down the chute. If the piece fails to cut off or doesn't drop onto the pickoff pin, the machine stops.

Speed of stock, measured on the outside diameter of the tube, is 500 sfm. The cross slides feed at 0.005 ipr, and the longitudinal slides feed at the rate of 0.010".

Double cups roll down the exit chute to a magnetic elevator. The elevator lifts the pieces to the feed chute leading to the 12" Chuckmatic. The exit chute in the single spindle screw machine and the magnetic elevator leading to the second machine can accommodate all sizes. The width of the feed chute can be changed quickly by a single adjusting arm to fit the size of the cup being run. Two electric eyes, one on the magnetic elevator and the other on the feed chute of the second operation, regulate the flow of pieces between machines.

Since the Chuckmatic can complete cups at twice the rate of the first operation, it isn't necessary to keep it running constantly. The electric eyes permit a bank of about 35 pcs to accumulate, enough to insure a reasonable running

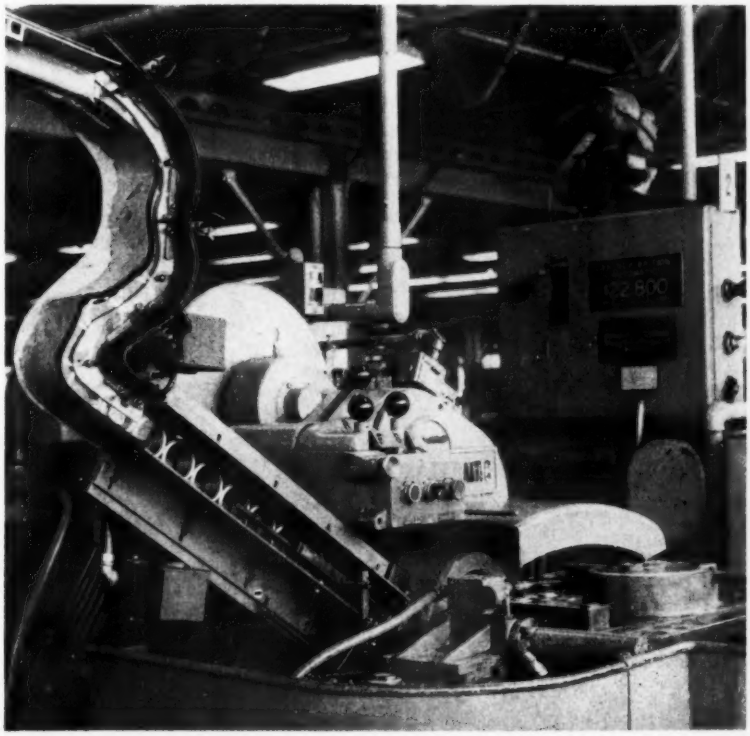


Fig. 3 The irregular shape of the feed chute was designed to prevent the bearing cups from falling too freely and possibly damaging the pieces.

time before the operator starts the second machine. The electric eye on the cup chute leading from the magnetic elevator to the chucker stops the elevator if cups "back up" to a certain point. Product from the first machine can then be diverted to tote pans and fed into the magazine feed chute of the second machine when it resumes operation.

An automatic loader in a "cross lie" position on the Chuckmatic picks cups from the feed chute and loads them into the chuck. The head of the loader fits into the bore of the cup and is expanded by a spring mechanism. A longitudinal slide with two carbide tools bores the second tapered raceway and chamfers the inside diameter. An automatic air-operated ejector head pushes the completed cup onto the pickoff pin. It retracts and allows cups to roll out exit chute. Pieces are loaded into pans and placed on a conveyor belt.

Roving inspectors as well as machine operators check at least every tenth piece on indicators mounted close to machines.

All tooling is carbide and preset in the tool cribs. The tools completing the outside diameter turn and the chamfer on the first machine are changed every four hours, the rest every eight hours. Operators make necessary adjustments for tool wear between changes to keep parts on tolerance.

Coolant, fed by a centralized system to all machines in the department, is a 3% soluble oil to water solution. An under-the-floor chip disposal system servicing the department removes all chips.

A self-contained system keeps machines oiled. To lubricate, a hose connected to an under-the-floor tube, dispenses grease from a central location, is attached to a fitting on the machine. Every eight hours machine fittings are greased.

The setup described is one of two located in this department. The second is basically the same as the first, except that a 4⅝" single spindle screw machine is combined with a 12" Chuckmatic for machining larger double cups. ■

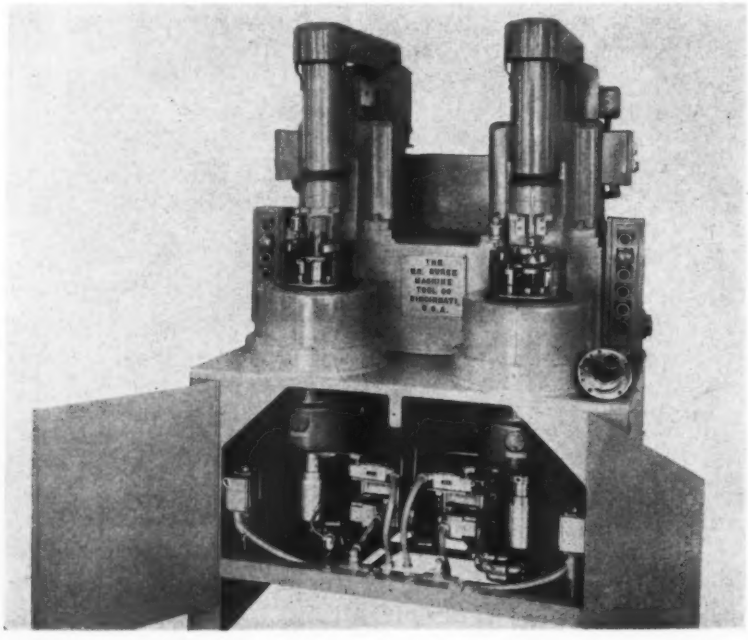
Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine 1975 Lee Road, Cleveland 18.

Two Heads Better Than One

A two-headed vertical Half-Mill is at work processing two automatic transmission pump units at a time for an American auto manufacturer. To activate this high-production rotary milling machine, the operator simply places the two parts to be milled on the two tables, and presses the "start" button. The Half-Mill was built by U. S. Burke Machine Tool Co., Cincinnati, Ohio.

The workpieces are held in the centers of independently powered rotary tables by air-actuated elevator clamps. Tables rise until the parts hit locators and start the automatic cycle. Release at completion of the cycle is also automatic, after the clamp descends with the part.

The power feed rotary tables revolve at 2 rpm. As each part turns, the cutter, a carbide end mill, rises and falls, milling oil grooves. A rise and fall cam, bolted to the periphery of each rotary table, assures the pre-planned precision in controlling critical depth and contour of the cutting action. An air cylinder forces the quill down so a roller guide attached to the quill is in constant contact with the cam. A brush with drip oiler attached precedes the cam follower to keep the cam surface clean.

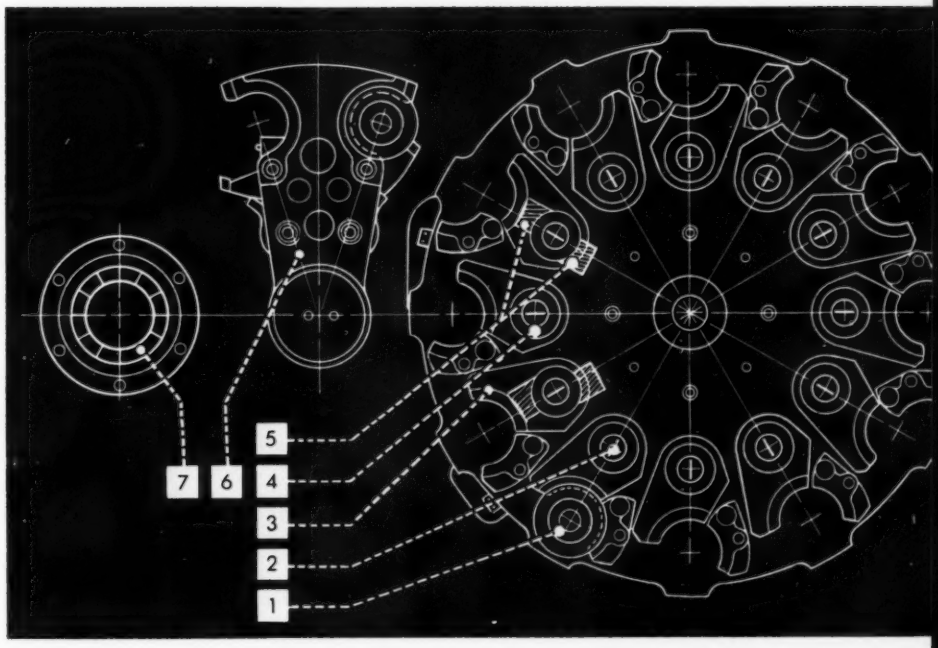


Quality Control Text Reviewed

QUALITY CONTROL, by Norbert L. Enrick. Published by The Industrial Press, 93 Worth St., New York 13, N.Y., 201 pages.

The author sets the tone for this fourth edition in his foreword "A simplified presentation from a practical viewpoint on the principles and techniques of quality control in the industrial plant."

Highlights of the text include the portions on ready-made sampling plans that save inspection and testing, two chapters on tolerancing that present statistical methods for establishing sound tolerances for individual products and for tolerance combinations, and the inclusion of information on control charts.



From the Cover:

One Approach To NC Tool Changing

Scully-Anthony Corporation's Mark I tool changer appears to have advanced sophistication worthy of consideration. It is offered in this light.

THE ADVANTAGES OF NC have been extolled in a flurry of magazine articles in the last year or two, but many potential users are yet to be impressed to the extent of serious consideration and action. Even without extensive acceptance, and with much "selling" of the concept yet to be done, we think it's time for a change of pace. Let's talk about the "business-end" of NC, as it might be called in multiple tool machines—the tool changing concept.

The basic requirements of an NC tool changing system, to endow a machine with the means of identifying and manipulating standard tools (drills, taps, mills, reamers, etc.) are: toolholders (1), a storage matrix—illustration shows twelve receptacles (3), a transfer mechanism (6), a chucking system for the spindle (7), and a coding procedure.

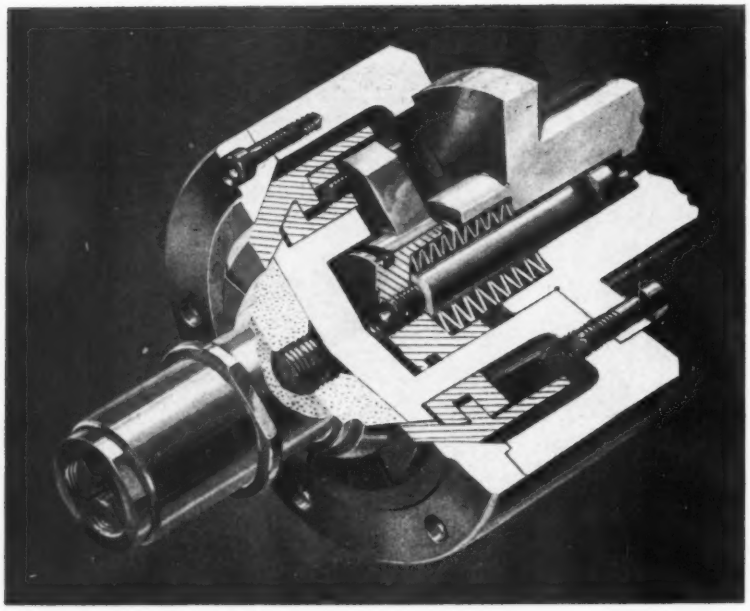
Cycle control and program equipment, required to operate the various elements, and additional functional components are needed to complete the system, but they are not covered here.

Although our discussion primarily concerns the concept, the concept depends on knowing some detail concerning the various elements:

Toolholders

The toolholder, illustrated, is inexpensive due to design sim-

What SAC says about their Mark I: It is fast and inexpensive because of minimal motion, and is available to all machine tool builders. It is for accurate light duty machines offering 250 ft lb torque (they're preparing a heavy duty Mark II). It was designed to save machine tool builders lead time and the expense of designing their own system. We think it shows much progress in the art, but development of the art is by no means complete.



plicity. This is important, since industry is reluctant to tear down preset tooling when a job is finished. The tendency is to store it as it is set in hope of future use.

One of the foremost motivations behind NC development was the need for greater facility in short run production tooling. Along with the short run trend, this type of easy change tooling can also be used for workholding. On a turning machine for instance, milling or turning can be economically scheduled.

Storage Matrix

The storage system (random) employed by SAC allows flexibility, as the tools can be located anywhere in the matrix. Since tools are chosen according to their code, intermixing is possible. At job change-over time, tools no longer needed for the job still running can be exchanged for those needed for the next job.

Whatever the tool mix, the spindle can go to work with any tool 3 sec after a change cycle is initiated. While work is being done, the matrix is being repositioned and a new tool is "picked" and held in stand-by with no lost motion.

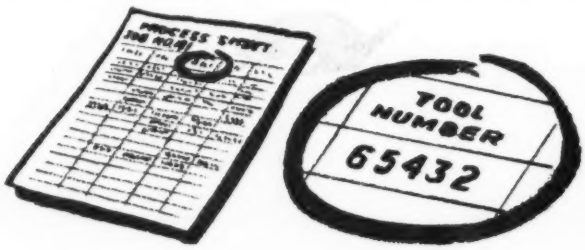
Transfer

Any transfer device should function as quickly as possible, since transfer time is not productive time. Arrested spindle time for a change can be reduced to 3 sec or less. With this system transfer time between spindle and storage is of no consequence, since the arm features double-holding capacity. A look at the geometry and component relationship shows arm movement on either side of spindle. The ability to "pick" and "return" in the same movement reduces cycle time considerably.

Automatic Chuck

One of the major advantages of the SAC chucking system is that no inserting motion is required. This in turn simplifies the transfer mechanism, which can do its work with movement in only one plane.

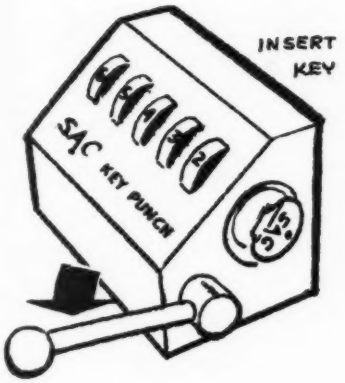
The toolholder squares up on a flat surface (the base of a cone), and chucking is by hydraulic fingers gripping the conical surface. These fingers also center the tool and exert tremendous holding pressure.

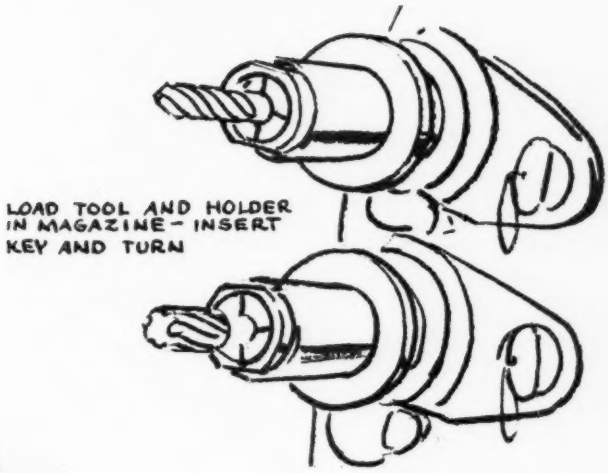


Coding System

SAC calls its coding system a tool code reference system because the code is not carried by the holder—it is referred to by a coded key.

The code data concerning a respective tool is carried on a key as a binary number. This is done by tabs like those on the key of an ordinary tumbler lock. The key is prepared in a key punch device,





as illustrated, at the time the tool is preset in the holder. The key is stored and travels with the holder.

When the holder and tool assembly are loaded in the storage matrix, the key is inserted and turned to physically set up the code transfer fingers for read-out.

Coincidence logic compares the code number on each cartridge with the number required by the machine controls. At coincidence, the matrix is caused to stop at the proper position.

Identification is by a five digit decimal number, used to designate five groups of four binary bits. The key has 20 lugs, and their presence or absence represents five groups of these bits. This gives a positive code with a possible 100,000 tool numbers.

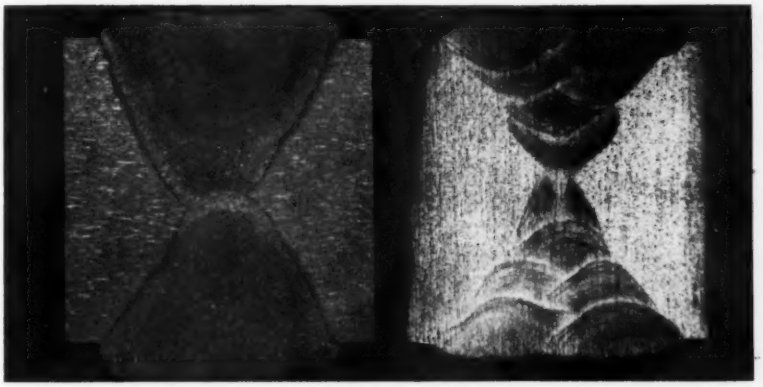
For a more detailed explanation and answers to your questions, circle Inform-A-Gram No. D2 for systems sheets. ■

Deep Welds . . . fewer passes

Welding of heavy aluminum plate in just two passes by use of high current densities, instead of the multiple passes normally required, has been accomplished in plate thicknesses greater than hitherto considered feasible, according to investigations of the department of metallurgical research of Kaiser Aluminum & Chemical Corp.

The department's welding engineering branch has accomplished two-pass welding with full penetration and high weld quality in 2″ 5083 alloy plate, utilizing automatic inert gas-metal arc (MIG) welding equipment. Basic welding equipment changes and proper joint design are desirable for successful two-pass welding of the heavier plate thicknesses.

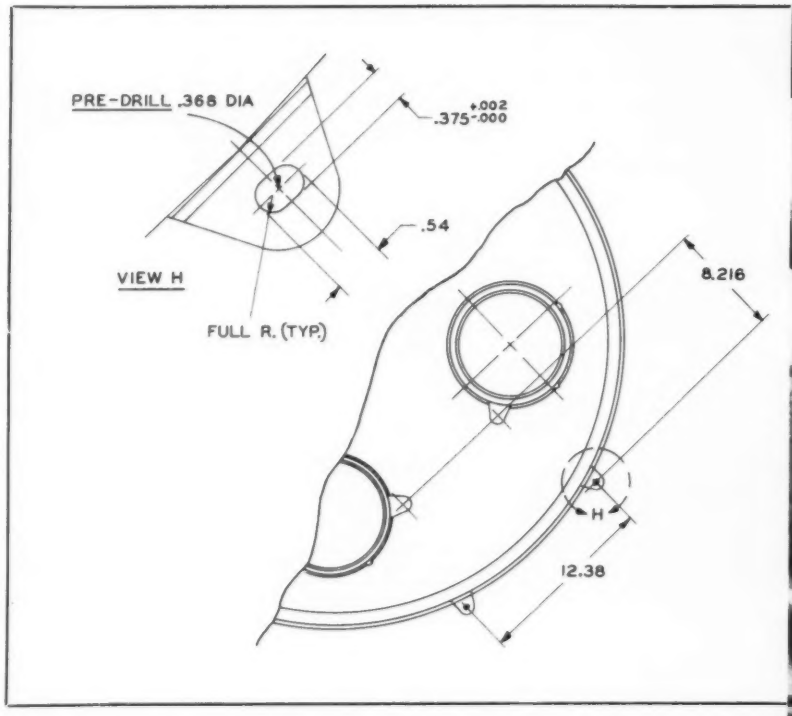
This welding development may extend the thickness range which

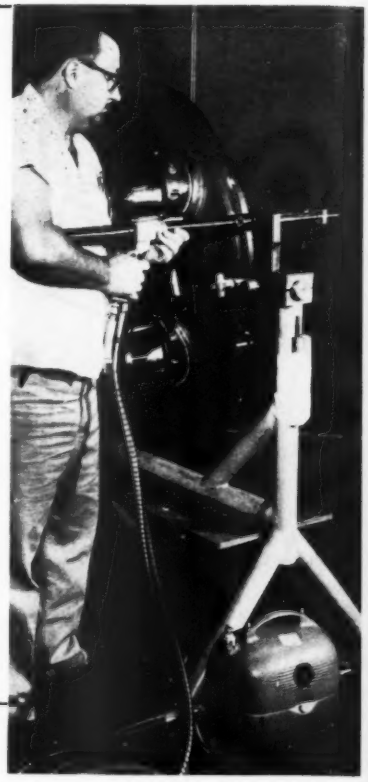


can be production-welded in two passes using automatic MIG welding equipment with 1/16″ filler wire from the present 1¼″ thickness to 2″. Under conventional welding practice, up to 12 weld passes are required to weld 2″ aluminum plate.

With two pass welding it was found possible to reduce welding arc time and the amount of shielding gas used by about 50%. In addition, the amount of edge preparation is minimized, and smaller quantities of filler wire are required. As a result, the cost savings per foot of weld are substantial.

The bend test is quite sensitive to weld defects, but no bend difficulties were encountered because the two-pass welds were free of porosity and dross.





Portable Broaching On Polaris

BROACHING has replaced boring, and enabled engineers at the Downey facility of Aerojet-General to hurdle a hole-making problem encountered in producing the Polaris missile.

The problem was in producing an oval hole at the correct angular relationship for mounting the fuel metering assembly. The closure assembly is an AMS256 weldment, heat treated to 200,000 psi.

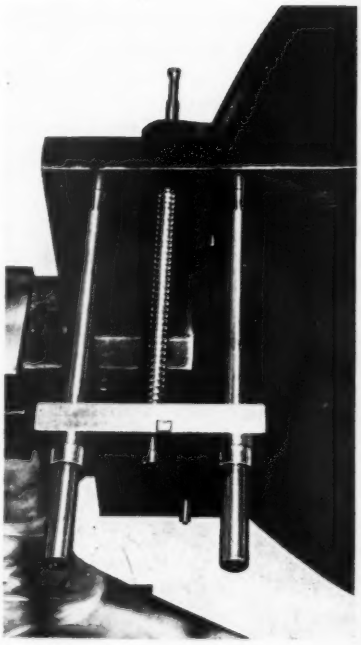
Expending 5 to 6 hrs/part on a horizontal boring mill, with a high rejection rate, made production engineers decide to look for a better method. They chose broaching as a possible solution.

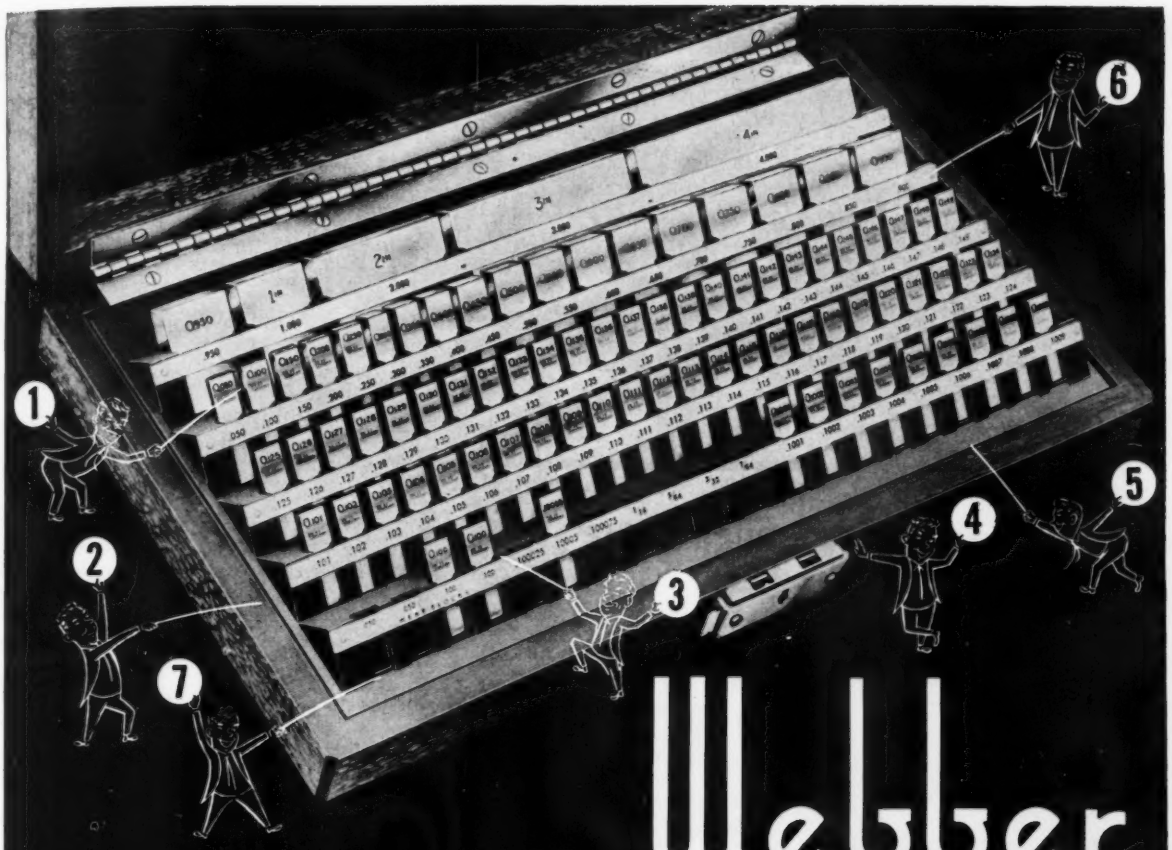
By taking the broaching machine and tool to the part, and using a guide fixture as illustrated, correct relative location is assured, and the oval shape is controlled by the broach accuracy. Total time is now 10 to 15 minutes.

Troublesome holes are machined through the use of a Chicago-Pneumatic CP-85ARDR pneudralic power unit, and a CP-659 portable broach gun. Operation is with 90 lbs plant air.

The assembly is mounted in a fixture providing convenient height for loading and pulling first and second pass broaches through the predrilled holes. Broaches are guided by a flat on the rear pilot of the fixture.

The application was engineered by the California Broach Co., specialists in the field of portable broaching. Aerojet found no special skills were required, and that with less than ½ hr of operator instruction they were able to do the job with no rejects. ■





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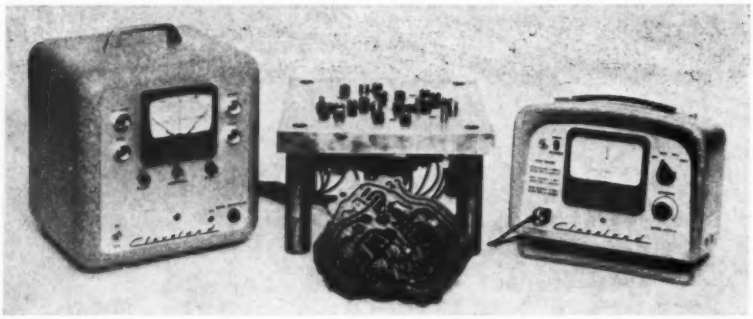

When either a transmission case or a cover plate is placed on the fixture, an automatic sequence of 17 checks determines any areas of possible leakage. With the electronic equipment developed for this special job by Cleveland Instrument Company, the entire gaging sequence is completed in 10 sec.

Shown here is a specially designed electronic gaging system to be used in the manufacture of automatic transmissions and transmission cover plates. The automotive manufacturer had the problem of determining in advance that a given surface would meet the maximum flatness deviation of 0.001 per inch of part length, and the maximum deviation of 0.005 from true flat from end to end.

In assembly, a paper gasket is sandwiched between the cover plate and transmission case. To be acceptably flat the cover ribs at the meeting face must prevent oil leakage, not only externally but inter-channel leakage as well.

The manufacturer's quality control department established that there was an urgent need for 100% piece check. After having tried other methods of accomplishing this and discovering that the inspection method being used could not keep up with production output demand, (and that the cost of the system was prohibitive), the Cleveland Instrument Company was given the problem.

With the Cleveland Instrument Company electronic system, after the part is placed in gaging position on the table-like fixture, a simple push on the amplifier start button begins the completely automatic sequencing of 17 gaging impulses. Any deviation from the manufacturer's quality control standards is immediately apparent. The entire gaging sequence is completed in 10 sec.

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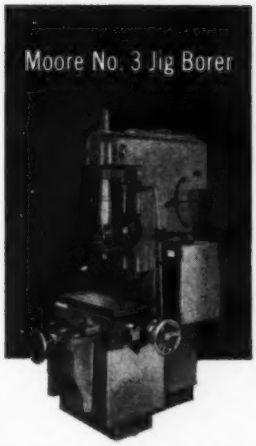

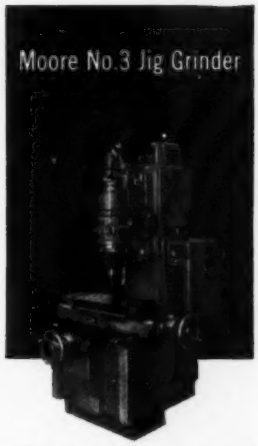

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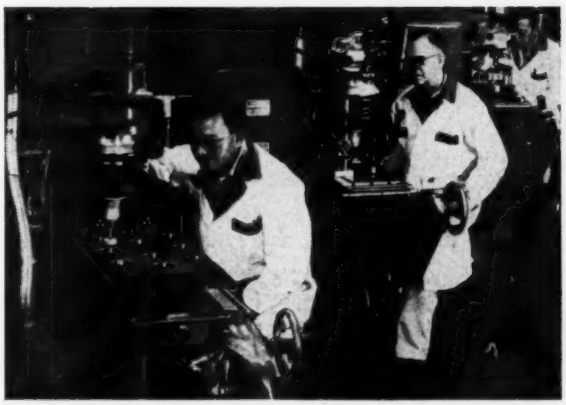
Among the highly skilled toolroom operators in the Federal Products Corporation, Providence, Rhode Island, is this talented jig grinder operator, Mrs. Florence Smith. Mrs. Smith achieves ultra-precise results with the No. 3 Moore Jig Grinder.



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CIRCLE INFORM-A-GRAM KEY NO. 66

Supplier and User Look At Drilling Today

Tooling & Production talked with suppliers and users to pinpoint some of today's "more than ordinary" drilling trends. Spade drilling, drilling with Sublands and automatic screw machine work on an abrasive alloy came to the surface as likely candidates for trend discussion.

A sales engineer who represents a number of drill suppliers reports that the spade drill is his fastest mover right now. Its use is limited to large diameter holes, ranging from 1 to 6", but it offers the advantages of insert tooling — regrindable tips and a reusable, low-cost holder bar.

Spade drills are being used economically in the Cleveland area. One application is drilling holes in aircraft landing gear components, and another is in the machine shop of a large die casting and injection molding machine manufacturer. (See "The Economies of Spade Drilling" elsewhere in this issue.) The latter user is "sold" on the spade drill as a lower cost replacement for twist drills in the work he's doing.

A producer of automatic screw machine parts has found that carbide-tipped drills aren't necessarily the solution for drilling small holes in an abrasive alloy. This firm's management would like to drill the beryllium-copper part with carbide to take advantage of carbide's abrasion resistance, but they've found that drills tipped with carbide won't withstand the cutting forces generated at the point on this job.

The part is a conductor center that's used in aircraft communications systems. It calls for a 0.196 dia hole to a depth of between 0.412 and 0.442 at about 95 sfpm. The "hook" they cut on the carbide drill point, to better penetrate the work, quickly broke down because of brittleness. They're now using an HSS drill that holds the "hook" longer, but has to be resharpened after 100 to 125 parts. They're learning how to live with the frustration of knowing that if they could keep that fine point on a carbide drill, they could produce

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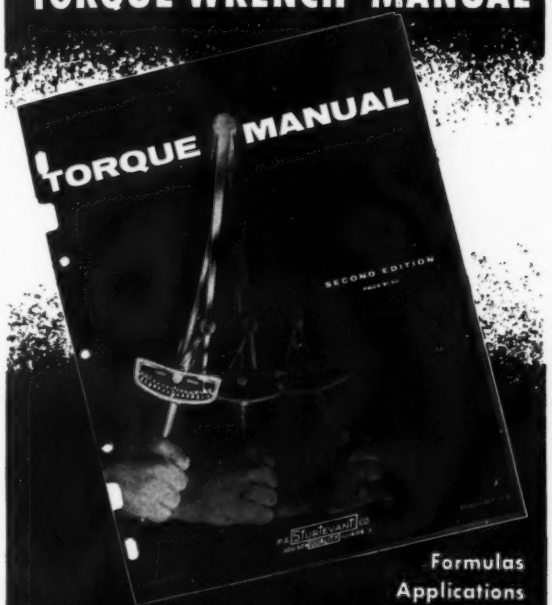

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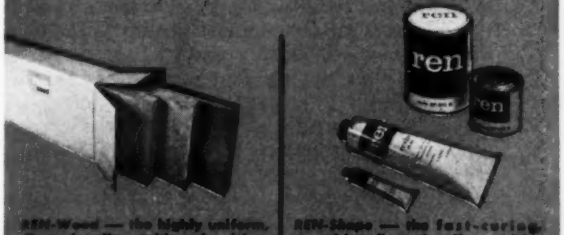

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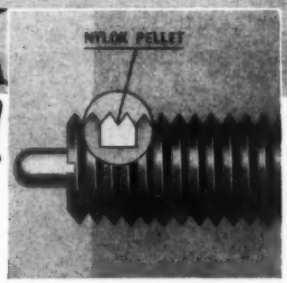


Nylok-fitted bodies are self-locking; eliminate need for checknuts or other secondary locking devices.

Whether you use Vlier Spring Plungers on tooling, or for original equipment applications, you'll like this new self-locking feature.

Each Vlier Spring Plunger body is permanently fitted with a tough, resilient nylon pellet which slightly protrudes above the major thread diameter. As the plunger is inserted in the tapped hole, this pellet is *compressed* (not cut), exerting a spring-like pressure on one side of the plunger body. This *constant* lateral thrust wedges the mating threads together, assuring a *positive* lock that remains vibration-proof regardless of cyclic loads.

PERFECT FOR USE WHERE PERIODIC ADJUSTMENTS MUST BE MADE—The self-locking feature is effective whether the body is seated or not, permitting the Vlier Spring Plunger to be easily and accurately adjusted as required...cannot back off or be shaken loose once set.

RE-USEABLE MANY TIMES—When the Vlier Spring Plunger is removed, the Nylok pellet strives to return to its original shape. Parts can be used numerous times before any locking pressure is lost.

NO EXTRA COST FOR SELF-LOCKING FEATURE—All standard Vlier Spring Plungers are now available with the self-locking feature at no increase in price! However, all models may still be ordered without Nylok.

Your Vlier distributor now has Nylok-fitted Vlier Spring Plungers on his shelf. Order a supply today.

VLIER
Engineering Corporation
A subsidiary of Barry Wright Corporation
8900 Santa Monica Blvd., Los Angeles 46, California

CIRCLE INFORM-A-GRAM KEY NO. 68

500 to 600 parts before regrinding.

In the Subland category, the "size optional" series made by Mohawk Tools, Inc., Montpelier, Ohio, continues to meet with success, and has been getting more and more "play" since they adopted a screw machine length.

Lyle Storrer, Mohawk's chief tool designer, says they can guarantee three to seven day delivery of drills in this series. This is one of the reasons it is popular with the screw machine user. Mohawk has found that since so much of today's drilling is in specialty applications, they can better serve the customer by grinding a drill to his specifications after they get his order. They carry standard diameter blanks in series. These are milled, hardened and polished HSS material, and stocked that way. When they get an order, they grind the flutes and point geometry to the customer's specs, using their own method of generating (by circle grinding) the smaller of the two diameters. They also carry taper shank and jobber length in the "size optional" series.

There are many ways to drill the same hole. The areas related here may help you find a more economical method than you're using now.

Production Management Book Reviewed

MODERN PRODUCTION MANAGEMENT, by Elwood S. Buffa. Published by John Wiley & Sons, Inc., 440 Park Ave. South, New York 16, N.Y., 1961, 602 pages, $10.25.

Dr. Buffa is associate professor, production management, UCLA. His text is divided into four sections: Part I — Introduction; Part II — Analytical Methods in Production Management; Part III — Design of Production Systems; and Part IV — Operation and Control of Production Systems.

Part III contains a timely chapter entitled "Computers and Automation" which establishes a healthy perspective for each, while Part IV treats such topics as quality control, inventory and production control, and wages and labor costs. The book is worthwhile reference material for management.

Machines live longer

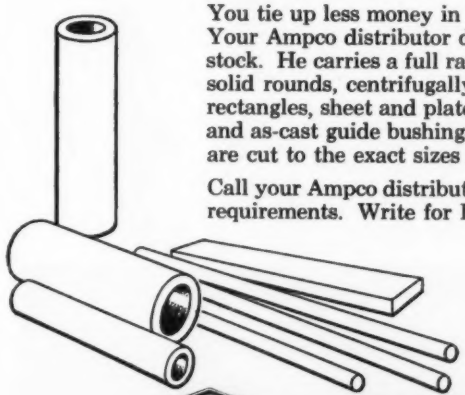
. . . when you make critical replacement parts from handy **AMPCO** *Stock Products*

Here's preventive maintenance at its best — an easy way to combat wear.

Strict laboratory control maintains important physical properties in Ampco copper-alloy stock products. They outlast ordinary bronze many times in severe service . . . reduce down-time by extending part-life in gears, nuts, bearings, bushings, other parts.

You tie up less money in in-plant inventories. Your Ampco distributor delivers immediately from stock. He carries a full range of sizes in extruded solid rounds, centrifugally cast stock bars, extruded rectangles, sheet and plate, stock die blanks, and as-cast guide bushings. Rod, sheet, and plate are cut to the exact sizes you need.

Call your Ampco distributor for all your copper-alloy requirements. Write for Bulletin G-51.



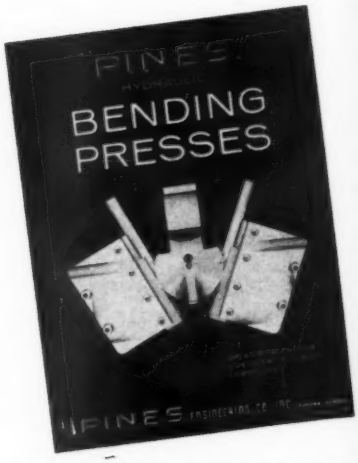
AMPCO®

AMPCO METAL, INC.
Dept. D-54 F • Milwaukee 1, Wisconsin
West Coast Plant: Huntington Park, California
Southwest Plant: Garland (Dallas County), Texas
CIRCLE INFORM-A-GRAM KEY NO. 69

T&P Catalogs & Literature

"High Power and Dual Power Dial Type Milling Machines" is the title of a 45-page booklet from Cincinnati Milling Machine Co. Also offered is a data sheet on their 3-hp independent overhead spindle. Inform-A-Gram No. C1.

Marking Inform-A-Gram No. C2 will bring you the Dumore Co.'s Catalog D-60-C. The condensed drilling catalog contains brief descriptive details and ordering information on drilling tools for holes from 0.001 to 3/8".



Faster, more efficient bending of parts made of tubing, pipe, rod, bar and certain shaped stock — Bulletin 379 from Pines Engineering Co., Inc., covers bending presses for these materials. Circle Inform-A-Gram No. C3.

A new compact bench type drill point thinning machine that thins and centers points of ½ to 3" dia drills up to 24" long is expounded in Bulletin 4500 from Farrel-Birmingham Co., Inc. Inform-A-Gram No. C4.

Deep hole drilling with Model 16-9 precision boring machine is outlined in Bulletin S-20 from Pope Machinery Corp. The super-precision boring machine operates at 1800 lbs/sq in at 3000 to 10,000 rpm depending upon size of drill (a range from 0.100 to 0.750"). Circle Inform-A-Gram No. C5.

High speed tool bits in three standard grades with typical analyses, recommended uses, sizes, standard package quantities and prices are included in a new catalog from Firth Sterling, Inc. Inform-A-Gram No. C6.

Star 3 profile grinder from Star Cutter Co. is described in an illustrated catalog sheet from the company. Inform-A-Gram No. C7.

Erickson Tool Co.'s complete line of inserted-blade spade drills and spade-drill holders is covered in a new catalog. It's yours for circling Inform-A-Gram No. C8.

Eliminate costly reading errors with the

"HELIOS"
DIAL VERNIER CALIPER with built-in DIAL INDICATOR
Direct Reading in .001"

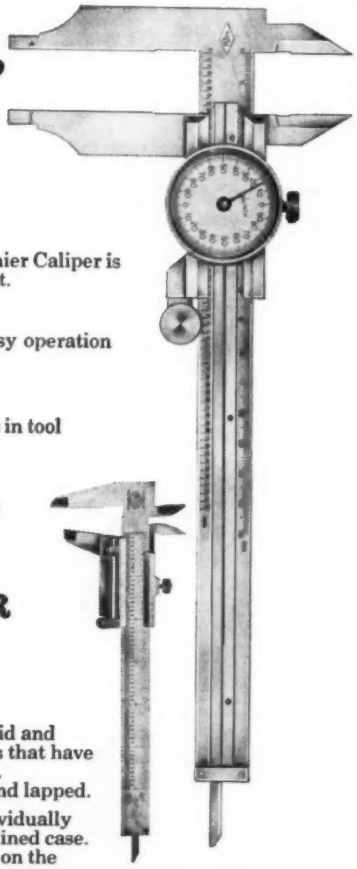
The world famous "HELIOS" Dial Vernier Caliper is hardened, ground and lapped throughout.

Other features:

- Thumb roll permits quick and easy operation
- Knurled lock screw
- 100% measuring capacity (outside, inside and depth.)

Available in 5", 6", 8" and 10" capacities in tool steel or stainless steel.

Height Gage Attachment optional.



"HELIOS"
SWING-JAW VERNIER CALIPER
with knurled lock screw

- Direct Reading
- Capacity 4¾"
- Length of Jaw 1⅝"

The swinging jaw allows a very easy, rapid and extremely accurate measurement of parts that have faces which do not lie along the same axis. This caliper is stainless steel, hardened and lapped.

Every "HELIOS" Vernier Caliper is individually packaged in a beautiful hardwood velvet-lined case. Write for detailed information and prices on the "HELIOS" Caliper line.

M. B. I. EXPORT & IMPORT LTD.
MBI
475 Grand Concourse, Bronx 51, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 70

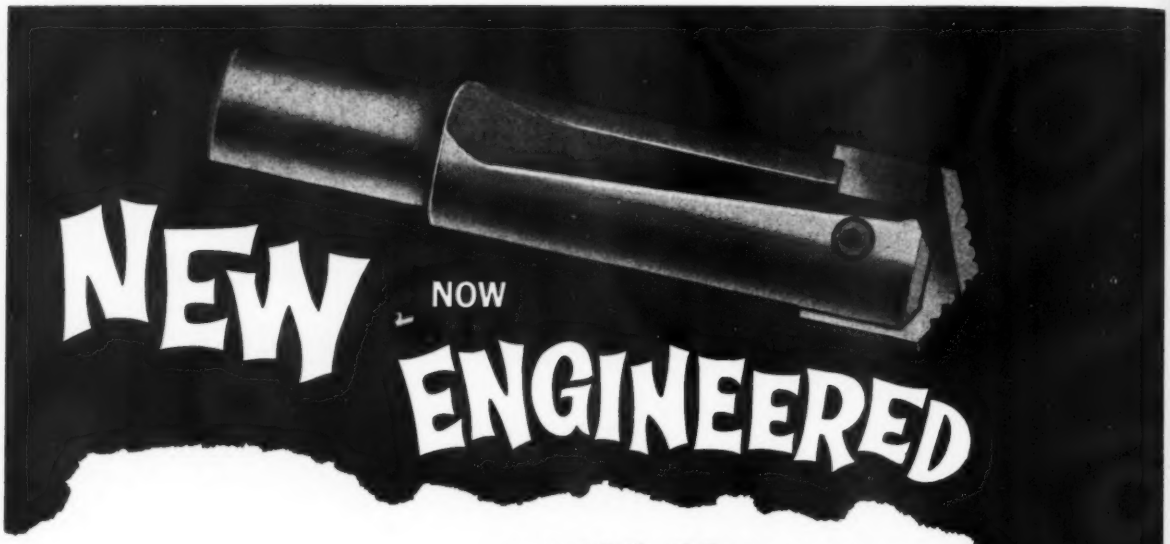
Which billet will give you uniform forged parts at lower cost ?

Make all the tests you want, but you still couldn't determine which of these forging billets is better. Reason: They're both Timken® fine alloy steel, as uniform as billets can be from length to length, from order to order. And it's this exceptional uniformity that saves you costly interruptions to make adjustments in your forging operations. Your forged parts are uniform. Your costs are lower.

You can be sure of uniformity in Timken steel because of our quality control, individual handling of your order, thorough, careful inspection. For the most for your money in your modern forging operations, specify Timken steel forging billets. And for expert help on your steel problems, call or write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

TIMKEN®
***Fine Alloy* STEEL**

CIRCLE INFORM-A-GRAM KEY NO. 71



NEW NOW ENGINEERED

ERICKSON INSERTED BLADE

EQUALS DRILLING ACTION OF TWIST DRILL

SPADE DRILLS

MORE RANGE AT MUCH LOWER COST THAN TWIST DRILLS

FULLY ENGINEERED BLADE GRIND...

Increased cross section at the cutting edge provides Greater Thermal Efficiency—Longer Tool Life than competitive blades.

FREER CUTTING ACTION

Exclusive Erickson method of grinding cutting angles gives Freer Cutting Action since end pressures are reduced.

"Heeling" eliminated.

EASY-TO-USE GRINDING FIXTURE...

Restores Original Factory Grind eliminating biggest obstacle to use of Spade Drills.

All cutting angles maintained during successive regrinds to original factory grind.

SPADE DRILL HOLDERS CORRECTLY ENGINEERED

"Funnel Effect" provided in flute design to speed chip escape.

Scientific distribution of coolant over whole cutting edge.

A-3124A

Send Your Drilling Problems to

ERICKSON TOOL COMPANY

34358 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS • AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS • EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through) • EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES (including gear-holding) • BORING BARS • SPADE DRILLS • RECESSING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 72

Catalogs . . .

Tapping machine Model 10E-20 from Kaufman Mfg. Co. is described in an illustrated folder. Also mentioned is Kaufman's specialized engineering service for standard or custom-built machines. Inform-A-Gram No. C9.

Tube bend radius blocks follow the new MS standard, and set up medium bend radii for conduit and fluid line tubing in sizes ranging from ⅛ through 3" OD. These radius blocks and associated tube bending equipment are shown in Catalog 4390 from Parker-Hannifin Corp., Inform-A-Gram No. C10.

How drive speeds of machines and processes can be automatically controlled and regulated by simple pneumatic instrumentation is explained in Bulletin G-2500 from Reliance Electric and Engineering Co. For this AIRtrol literature on versatile automation circle Inform-A-Gram No. C11.

Proficorder for measuring and recording roundness, flatness, roughness, waviness, scratches, flaws and total surface profiles is described in a new brochure from Micrometrical Mfg. Co. Inform-A-Gram No. C12.

Cylinder mounting accessories such as female rod clevis, female rod eye, clevis bracket, mounting plate and pivot pin, are assembled in a new reference bulletin from Hannifin Co. Circle Inform-A-Gram No. C13.

Filing, lapping, honing, polishing, scraping and sawing can be done with the Di-Profiler reciprocating hand machine. The unit is featured in a booklet from Hyprez Div., Engis Equipment Co. Inform-A-Gram No. C14.

High speed steel, carbide tip or solid carbide drills, reamers and cutters that set new standards, solve new production problems, are outlined in a brochure from Special Drill & Reamer Corp. Inform-A-Gram No. C15.

dependable Logan 14" LATHES

How is a lathe's dependability measured? One criterion is the lathe's *productive* life-span. And this life-span is largely determined by the lathe's quality of design and construction. The Logan lathe bed is an example. It withstands the heaviest bending and torsional stresses. A special alloy and thorough seasoning (before and *between* machining) insure a warp-free bed. Also, the two V-ways and flat ways are precision ground. You can depend on Logan's low operating cost, too. The 14" swing lathes have variable speed drive (40 to 1400 RPM), and are instantly adjustable while work is turning—*without* shifting belts! You can also depend on the flexibility of Logan lathes. They have a 9" swing over saddle, 14⅝" swing over bed, and a 1 1/16" collet capacity to permit a wide variety of operations. But, specifications tell the full story. So, write today for complete information.

MODEL 6510
$1,775.00
F.O.B. FACTORY

Logan
LOGAN ENGINEERING CO.,
4901 W. Lawrence Ave., Chicago 30, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 73

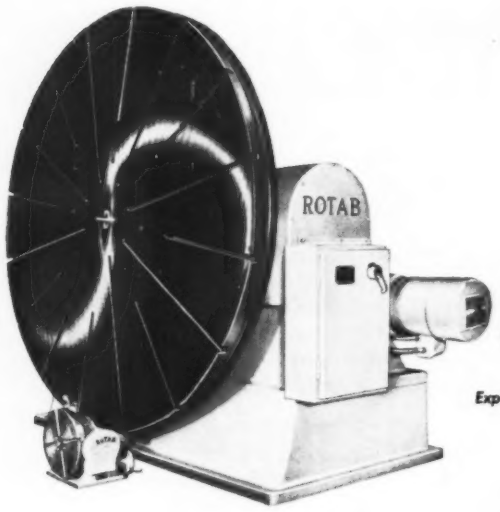
Catalogs . . .

Single point carbide tipped lathe tools, straight turning tools and others are covered in a pricelist-brochure from Capitol Tool & Carbide Corp. Inform-A-Gram No. C16.

Four cost-saving machines for dry and wet abrasive cutting, and non-ferrous cutting are illustrated in a bulletin from Rockwell Mfg. Co.'s Delta Power Tool Div. Inform-A-Gram No. C17.

A new bulletin from Erickson Tool Co. presents detailed specifications and engineering data on speed-indexer models 400, 450, and 600. The new speed indexers use pneumatic or hydraulic power to index rapidly and accurately, either manually or automatically. Inform-A-Gram No. C18.

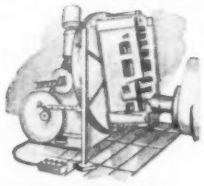
The Greenleaf Corp.'s complete line of toolholders, milling cutters, locking wedges and special tooling is presented in Catalog 161. Check Inform-A-Gram No. C19.



Faceplates from 12" to 84" in diameter
5 second accuracy standard . . . 2 seconds available

Inspection and Quality Control

Experimental and Tool Room Layout



Tool Room Machining

APPLICATIONS UNLIMITED... ROTAB© UNIVERSAL TABLES

Applications for *ROTAB* precision tables are, in fact, limited only by user imagination. For *ROTAB* units are being successfully utilized for receiving, tool and gaging, stage and final inspections, and for analytical spot checks on parts in process. *ROTABs* are proving highly effective in quality control for statistical data procedure, quality, casting and pattern analyses. They're saving time, increasing accuracies in experimental and tool room layout, too. And they've even performed outstandingly as cost-cutting machining fixtures for high accuracy positioning of difficult and complex tool room operations.

How does *ROTAB* come by this versatility? By offering single set-up, 3-dimensional positioning with optically precise 5-second accuracy (and with readings to 1 second repeatability!), motor-driven, pendant controlled movement, horizontal loading and many more advanced engineering features. *You* can use *ROTAB*, and we can show you how.

Write today for your FREE ROTAB CATALOG!

MP MACHINE PRODUCTS CORPORATION
6771 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 74

Compressed-air-line filters, pressure regulators, air-line lubricators, valves etc. are mentioned in 64-page Catalog 1000 from C. A. Norgren Co. Inform-A-Gram No. C20.

A new precision grinding vise was designed to facilitate square grinding in two planes without removing part. The accurate, sturdy vise is outlined in a data sheet from the Producto Machine Co. Inform-A-Gram No. C21.

The "Ground-from-the-Solid" process of producing drills from uniformly heat-treated mill length bars of hardened high speed steel is described in a booklet from Ace Drill Corp. Also mentioned are Ace Longboy, stub, Hi-Brinnel, carbide and taper length drills. Inform-A-Gram No. C22.

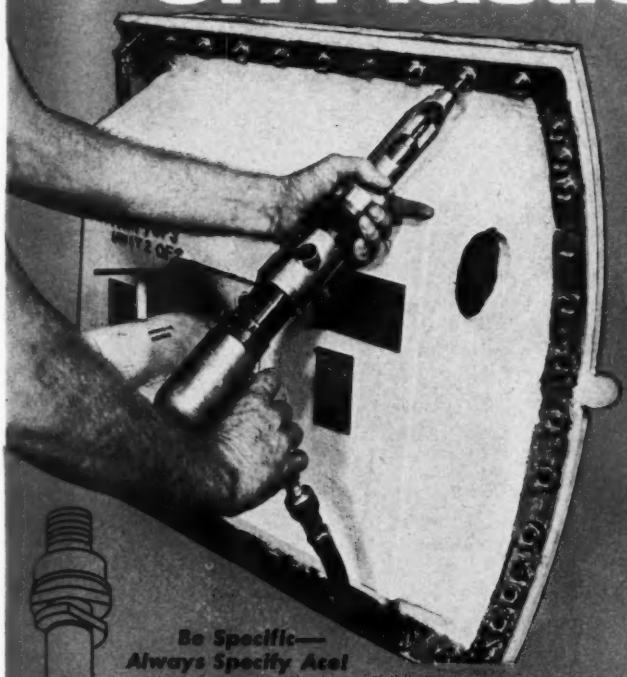
Cutters, reamers and special tools made to specifications by Special Cutter & Tool Co. are illustrated in a brochure. Also mentioned are keyway and interlocking milling cutters. Inform-A-Gram No. C23.

"Precisioneering and Productioneering" is a 52-pager from Oberg Mfg. Co., Inc. Bulletin 261 contains descriptions of numerous progressive E & I and ballast dies, thick material dies, special shape and form dies, and carbide slot or index dies. C24.

For Fast, Accurate Mounting

OF MECHANICAL AIR-FEED DRILLS — BACK SPOT FACERS AND TAPPERS

on Plastics... or Metals



Be Specific—
Always Specify Ace!

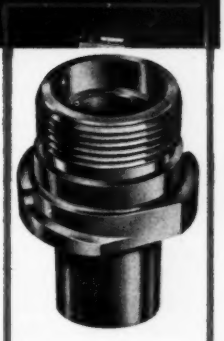
ACE-KELLER

***ACE ADAPTER TIPS AND LOCK LINERS**

made from 52-100 long-wear bearing steel, provide a fast, accurate method for portable or stationary mounting of drilling, tapping and other self-contained machining units on a jig or fixture. The threaded end of the drill bushing tip screws into the nose end of the drilling unit. Locking flanges on the tip fit under the shoulders of lock screws or lock strips on the jig, effectively holding the drilling unit in alignment position and absorbing both the thrust and torque of drilling.

***ACE-KELLER DRILL BUSHING TIPS**

ACE Precision Adapter Tips and Lock Liner Bushings are designed for fiberglass and plastic tooling requiring the use of automatic feed drill motors. The ACE adapter tip fits all standard automatic feed drill motors such as Keller, Aro, Buckeye, Quackenbush, etc. A close tolerance is maintained when drilling rivet holes in stainless steel, titanium, nickel and other hard or exotic metals.



Patented
U.S. and Canada

Stocked for Immediate Delivery by Leading Tooling Specialists in Your Community

Made by the Makers of

ACE DRILL BUSHINGS

Home Office • 5407 Fountain Ave. • Los Angeles 29

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MICHIGAN
10602 West Nine Mile Road
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CIRCLE INFORM-A-GRAM KEY NO. 75

New KENDEX* BB-7000 K-BARS

. . . 5 small diameter bars designed for precision boring

The combination of a Kennametal* shank, three times as rigid as steel, and Kendex "throw-away" inserts, with three indexable cutting edges, provides many cost-reducing advantages for high precision boring.

Small diameter K-Bars practically eliminate chatter, deflection, and vibration. As a result, they assure straighter holes, closer tolerances, and a better finish that often eliminates subsequent grinding. A K-Bar can often remove as much metal in one pass as a steel bar would remove in two or more passes. The ratio of length to diameter of K-Bars with Kennametal shanks exceeds the practical limits of bars with steel shanks.

BB-7000 K-Bars are available in diameters from 3/8" through 1", with minimum bore diameters ranging from .500" to 1.375", and chip breakers made of Kennametal for better chip control.

For more complete information—and a demonstration of BB-7000 K-Bars—call your Kennametal Representative, or write KENNAMETAL INC., Latrobe, Pa.

*Trademark

33600

When purchased as a set, the five bars are delivered in a sturdy oak case for protection and convenient handling in tool rooms. The "package" also includes extra inserts and spare parts.

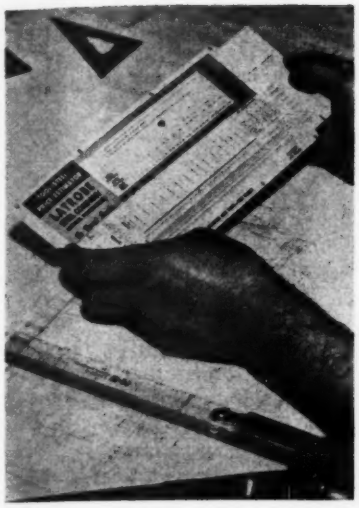
Five Sizes of BB-7000 K-Bars Positive Rake • Solid Kennametal Shank					
Diameter	3/8"	1/2"	5/8"	3/4"	1"
Length	6"	8"	8"	10"	12"

Larger Diameter K-Bars available with adjustable heads.

INDUSTRY AND KENNAMETAL ...Partners in Progress

CIRCLE INFORM-A-GRAM KEY NO. 76

Catalogs . . .



A slide-rule price estimator and weight calculator for use by tooling engineers, toolmakers, and purchasing agents is offered by Latrobe Steel Co. It lists the firm's high speed steels, die steels and tool steels, and is yours for checking Inform-A-Gram No. C25.

Adapter fittings, pipe thread and straight thread adapters for tubing system connections are outlined in Catalog 4360 from Parker Fittings & Hose Div., Parker-Hannifin Corp. The revised and expanded literature now covers straight thread adapters with new metal sealing rings. Inform-A-Gram No. C26.

A new coolant system consisting of coolant container, dual control valve assembly, and dual tube assembly is featured in Bulletin 37-CA by Trico Fuse Mfg. Co. Check Inform-A-Gram No. C27.

Three styles of air chucks for work or tool holding in rotating or nonrotating applications are described in a new bulletin from Erickson Tool Co. Inform-A-Gram No. C28.

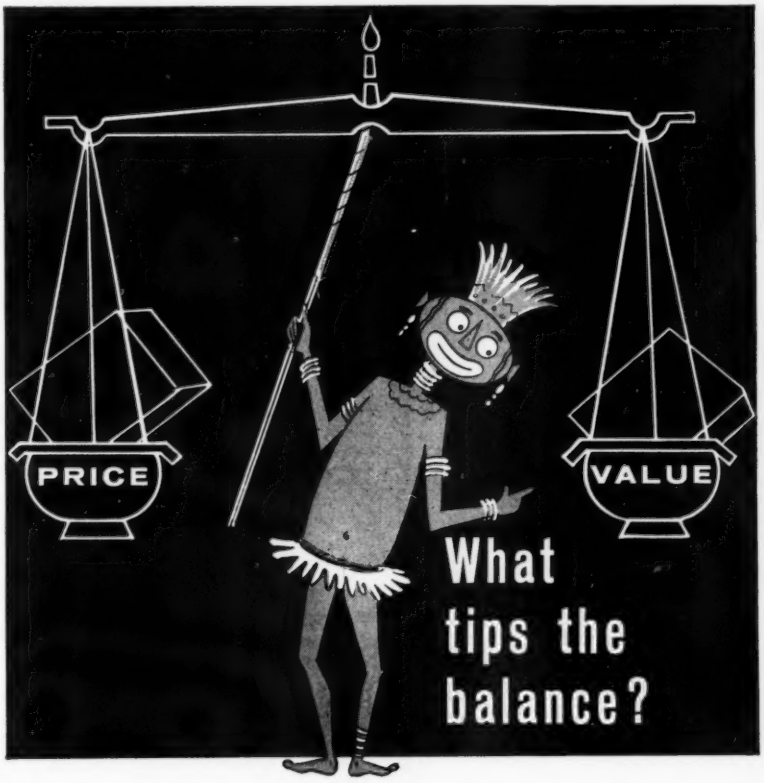
A new lubricating stick, containing molybdenum disulfide solid lubricant in a resin binder, and its usefulness on grinding wheels and cutting tools is described in Data Sheet 128 from Alpha-Molykote Corp. Inform-A-Gram No. C29.

The exclusive construction and design features of Zeh & Hahnemann straight side double crank presses are highlighted in a bulletin from Dechert Dynamics Corp. Interested? Circle Inform-A-Gram No. C30.

A quick-change tooling system that reduces machine tool downtime and increases operating output is covered in a new brochure from DeVlieg Microbore Div. Inform-A-Gram No. C31.

Unipunch universal punch and die sharpener is illustrated and described in Catalog 1125 from Punch Products Corp. For more information on this self-contained, portable, bench-type sharpener, circle Inform-A-Gram No. C32.

The full line of constant horsepower infinitely-variable-speed standard milling spindles from Colonial Broach & Machine Co. is featured in Bulletin CMS-61. Inform-A-Gram No. C33.



Our customers know that buying on quality pays off! They've weighed the price (sometimes a few cents more) against WHAT REALLY COUNTS. They've found cost-per-piece of drilled parts consistently lower and upkeep expense invariably less with U.S. multiple spindle heads. They've found that quality materials and workmanship back up sound design in every U.S. head. US Unrealistic pricing and price cutting can lead only to product degeneration. Our customers know that **buying on quality pays off.** They've proved it many times!

US DRILL HEAD

Adjustable and Fixed Center Multiple Drilling Heads — Individual Lead Screw Multiple Tapping Heads — and Fixtures.

UNITED STATES DRILL HEAD COMPANY
5298 River Road • Cincinnati 33, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 77

Catalogs . . .

Press feeding magnets designed and engineered for handling blanks, stampings or formed steel parts are illustrated in a bulletin from Magni-Power Co. Inform-A-Gram No. C34.

"Getting the Grip on Precision" is the title of Bulletin JR361 from Royal Machine & Tool Corp. It covers grip-lock, custom chuck jaws and special holding devices. Inform-A-Gram No. C35.

Chuck and collet actuators, described as non-rotating air cylinders with a large center hole, and used to operate air and collet chucks, are described in Catalog 30261 from Power Grip, Inc. Mark Inform-A-Gram No. C36.

Whether to mill with conventional cutters or throw-aways is answered in an unbiased engineering discussion Bulletin 4-61 from Wesson Co., 1220 Woodward Hts. Blvd., Ferndale 20, Mich. Write for free copy. C37.

More than 450 boring bars, boring heads, boring bar blanks, arbors, spacing collars, bearings and nuts, taper shank milling, drilling and boring accessories, are listed in the new Beaver Tool & Engineering Corp. catalog. Also featured are Ogesto adjustable quick change tools designed for tape control machines or conventional machines. Circle No. C38.

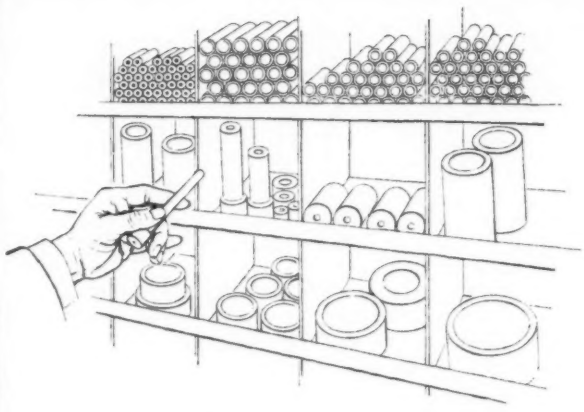
There are nuts galore in a new 20-page catalog from the Grip Nut Co. The booklet contains lock nuts, clinch nuts, weld nuts, special nuts and semi-finished nuts and their size ranges, physical and mechanical requirements. Circle Inform-A-Gram No. C39.

Five models of Natco hydraulic press brakes (200 to 500 tons) are covered in a bulletin from National Automatic Tool Co. Die lengths vary from 144 to 200.5". Cycle time is from 15 to 22 sec/stroke. Daylight dimension for all models is 16". No. C40.

A hydraulically operated Mecatorn spinning machine for working stainless steel and other high tensile steels up to 1" thickness and up to 10 ft dia, is outlined in a bulletin from C. W. Torngren Co. Inform-A-Gram No. C41.

"The Reel Story" illustrates and describes Aero-Motive Mfg. Co.'s varied line of industrial reels for cords, cables and hose. Circle Inform-A-Gram No. C42.

Sizes, capacities and special features of Ripley standard and magnetic line and sump strainers for hydraulic applications are outlined in Catalog R-103 from Ripley Screen & Strainer Co. Inform-A-Gram No. C43.



SUPERMARKET STOCK

ANOTHER SERVICE ANGLE—Emergencies are something we can very well do without—especially when carbide dies are concerned! Emergencies can shake-up the production picture and smash the profit build-up! For example, you are in immediate need of a carbide piercing punch (or bushing). Job is—GET IT FAST!

The Oberg customer solves the problem this *special* way—he contacts the Oberg plant! He knows that a complete size range of unground piercing punches (and bushings) is always available, and that Oberg maintains a supermarket of unground carbide blanks for emergency die repair.

Oberg is something special!

Oberg Manufacturing Co., INC.
FREEPORT, PA.

Now available! **NEW** *Bulletin 261 describes Oberg dies, carbide components and services. Send for it today!*

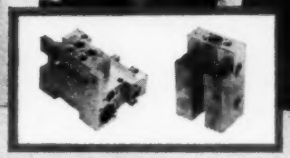
CIRCLE INFORM-A-GRAM KEY NO. 78

BURGMASTER Triples Valve Body Production ... Scrap Parts Reduced By Hundreds

58 Holes Drill and Ream Each Body

Micro Tool and Engineering Company, North Hollywood, California replaced six in-a-line spindle drills with 4 new Burgmaster Bench Model six spindle turret drills to triple the production of aluminum hydraulic valve bodies that required 58 drilled and reamed holes in each part. Two Burgmaster machines, using 10 of the available 12 spindles are now used to replace the six in-a-line single spindle drills for drilling and reaming 58 holes from 1/32" (30 diameters deep) to 5/16" diameter. Spindle speeds of 6200 rpm permit .014 drilling efficiently to 5/16" depth. The other two Burgmaster units are used to drill and ream a variety of hydraulic valve bodies. Savings on this project of 5 hours per part has been effected through the elimination of load, unload, positioning and drill change operations. The new 24 drill spindles now take up only 60 per cent of the floor space required by the original six single spindle machines.

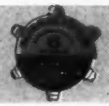
WRITE FOR LITERATURE covering machines and accessories including the Burgmaster AUTOMATIC Bench Model Turret Drill with power feed and the new hand positioning table accessory. Dealers located in principal cities.



Job Facts

Company:	Micro Tool and Engineering
Machine:	Burgmaster Bench Model 6-Spindle Turret Drill
Parts:	Aluminum Valve Bodies
Operation:	58 holes drill and ream each
Holding:	Box Jig with Drill bushing
Former method:	Six single spindle drills
Present method:	2 Burgmaster Turret Drills
Advantages:	Triples production, eliminates scrap, cuts floor space. 66%.

Kearney & Trecker, C.V.A. Ltd., Sole Agents for Great Britain, British Commonwealth and Western Europe.



BURGMASTER CORPORATION
Small Tool Div., Burg Tool Manufacturing Co., Inc.
13226 S. Figueroa St., Box 311, Gardena, Calif.
Phone: FAculty 1-3510 Phone, wire or write Dept. OA

CIRCLE INFORM-A-GRAM KEY NO. 791

KUTMORE ADJUSTABLE HOLLOW MILLS

- Any COMBINATION of . . . Turning . . . Tapering . . . Facing . . . Chamfering . . . Trepanning in ONE PASS.
- Exclusive MICROMETER Adjustment Feature For Rapid Set-Up.
- Area Sales engineers for your immediate Problems.

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Small compact couplings, PUSHOMATIC one-hand connect or disconnect. Automatic locking — high-pressure connection. Maximum flow.

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- Automatic action
- Integral shut-off
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Interchangeable with all popular makes. Fast, easy one-hand "push" action connects or disconnects lines instantly.

- Interchangeable
- Automatic locking
- One-hand operation
- Full swivel action

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Full unrestricted flow. Same inside diameter as nominal pipe or supply hose. Sleeve action. Fast transfer of media.

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- Rugged construction

DOUBLE SHUT-OFF

Shut-off valve in socket and plug stops the flow from both lines when disconnected. One-hand operation.

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- Two-way check valve
- Automatic
- One-hand operation

All disconnects available from stock in various metals, end connections and sizes. Write for Bulletin 1475.

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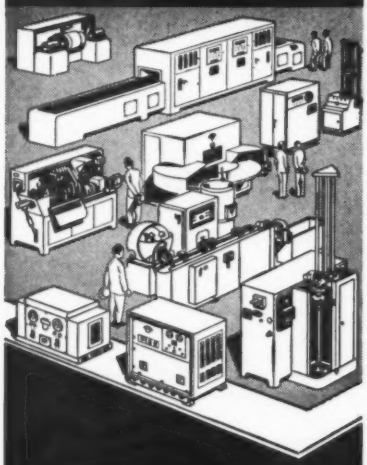

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DESIGNED FOR YOUR TOUGHEST PRECISION CUTTING JOBS

MATERIAL:	Grey cast iron.
JOB:	Bores three diameters; faces two surfaces; cuts one chamfer.
TOOL:	Eclipse multi-operation carbide tipped inserted blade cutter equipped with a replaceable bronze wear stripped pilot.
RESULT:	Finer finish, accurate size and absolute concentricity.

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ECLIPSE COUNTERBORE COMPANY
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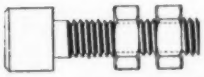
CIRCLE INFORM-A-GRAM KEY NO. 802

REST BUTTONS OF MANY TYPES
To Save Time and Labor



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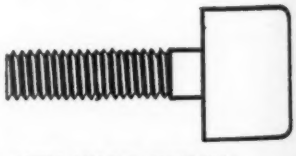
Used extensively on jig and fixture work. Black penetrate finish. Soft. Seven Sizes.

OTHER TYPES

Include Press-Fit in 3 sizes. Circular Jig Feet and Jig Rest Pads also available.



HEX-HEAD SCREW

The latest thing in jig feet. Easy to install. Body length held. Black penetrate finish.

Send today for Reid's big free 88 page catalog, listing 2,000 items needed in tool rooms.

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CIRCLE INFORM-A-GRAM KEY NO. 803

Catalogs . . .

New clamp assemblies and fixture components from Accurate Bushing Co. are outlined in Catalog JF-61. To receive the catalog, which contains more than 1000 ABC clamp assembly and fixture component items, circle Inform-A-Gram No. C44.

Specifications on more than 400 different types and sizes of precision surface equipment are given in Catalog 840 from Challenge Machinery Co. This larger edition also embraces granite surface plate equipment and semi-steel angle plates. Circle Inform-A-Gram No. C45.

A new self-tuning, transistorized 20-K line of ultrasonic cleaners is outlined in a bulletin from Acoustica Associates, Inc. Advantages described are light weight, selectable power levels, automatic load and liquid level compensation, on-off control, high over-all efficiencies, etc. Inform-A-Gram No. C46.

A new Delta 7″ grinder with Twin-Lite safety shields is the subject of a bulletin from Rockwell Mfg. Co.'s Delta Power Tool Div. Circle Inform-A-Gram No. C47.

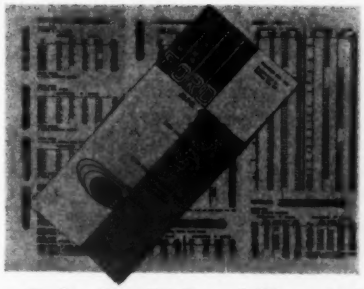
Clamps abound in Catalog 61 from Wetzler Clamp Co., Inc. Circle Inform-A-Gram No. C48 and see the newest in handscrews, clampettes, band clamps, pipe clamps and fixtures, spring clamps, etc.

High speed drill presses, drilling motors, multiple head bases used in instrument manufacturing and secondary screw machine operations, are outlined in a brochure from Electro-Mechano Co. Inform-A-Gram No. C49.

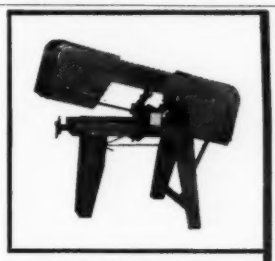
Product development and new applications at the Yoder Co. are covered in a new metalworking equipment publication called "Yoder Product News." Circle Inform-A-Gram No. C50 for the first copy, or to be placed on the circulation list.

A new 7″ dia Milichex rotary indexing table that provides whole-degree angular indexing with an accuracy of ¼ sec of arc is the subject of Data Sheet X060-A from Michigan Tool Co. Inform-A-Gram No. C51.

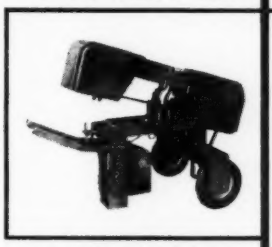
Specifications and case histories for the 10 tape controlled systems available on Burgmaster Corp. turret drills are given in a booklet from that company. Models 2BHT, 25AHT, 3BHT and 3BHT-B are highlighted. No. C52.



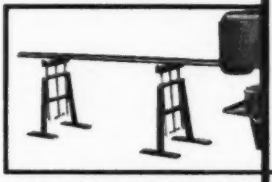
End mills, Hi-Roc drills, spiral flute drills, reamers, ground cutters and uniflute countersinks are listed in Bulletin 102 from M. A. Ford Mfg. Co., C53.



Model B (Wet or Dry) Dependable. Economical. Easily handles 5" rounds, 10" flats.



Model M (Mobile). Rolls to the job, inside or out. Capacity: 5" x 10"



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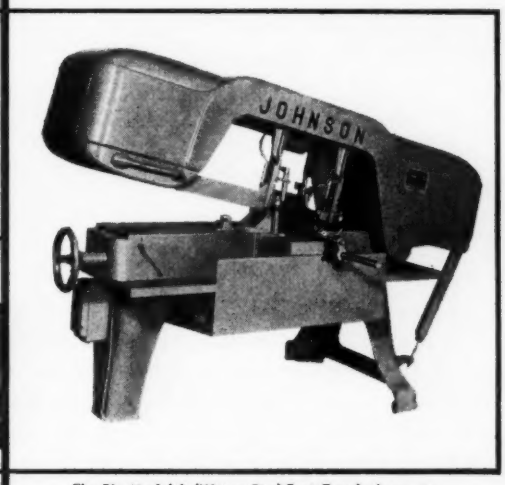
Johnson

Speaks for itself in ANY SHOP!



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The big, dependable Johnson delivers more saw for less money. It easily and accurately handles anything in your stock pile: rods, angles, tubes, heavy rounds, irregular shapes, and flats.

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CIRCLE INFORM-A-GRAM KEY NO. 81

Catalogs . . .

"Coated Abrasives" is a 20-page listing of discs, sheets, rolls, belts, sleeves, cones, molded discs and accessories. It's available through Inform-A-Gram No. C54 from The Carborundum Co.

Bulletins on general purpose grinding wheels and plain cylindrical grinding wheels from Simonds Abrasive Co. are available through Inform-A-Gram No. C55.

A low-speed version of Servo-Tek Prod. Co.'s versatile line of speed indicating systems is described in a catalog from the company. The new model indicates speeds of 10 rpm and lower with accuracy of better than 2%. Inform-A-Gram No. C56.

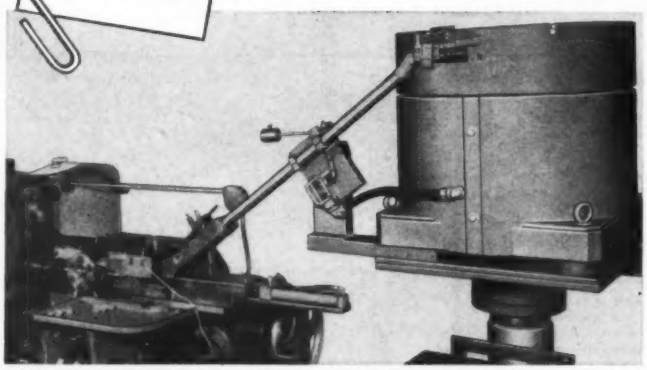
A new line of valve-in-head tandem cylinders, type BVT, is featured in a brochure from Allenair Corp. Circle No. C57.

SYNTRON CASE HISTORY

another successful application in the

MACHINERY MANUFACTURING INDUSTRY

No. 3540



SKINNER ELECTRIC VALVE DIVISION, New Britain, Conn. increases second operation work as much as 30% with SYNTRON PARTS FEEDERS

A recent improvement developed by Brown & Sharpe Company, Providence, Rhode Island, is the automated loading of automatic screw machines. This improved method which drastically improves loading efficiency utilizes Syntron vibratory bowl-type Parts Feeders which automatically supply parts in an oriented single-line, rate-controlled feed through a Brown & Sharpe designed automatic turret loading arrangement to a Skinner Power chuck. Skinner Electric Valve Division management says, "The Syntron Parts Feeder is very versatile and will accommodate parts of different size through the same Feeder. It is also trouble-free." With regard to their performance, Skinner Electric Valve offers, "Installations of this equipment in the field have increased the efficiency on second operation work as much as 30%."

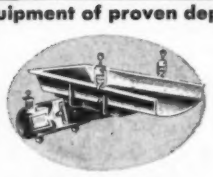
For your parts handling application, why not investigate the possibilities of Syntron electromagnetic vibratory bowl-type Parts Feeders.

Write for a Syntron catalog section on Parts Feeders and the name of the representative near you.

SYNTRON COMPANY
341 Lexington Avenue • Homer City, Pa.

"Other Syntron equipment of proven dependable quality".

Transfer & Storage Parts Feeders



Vibratory Feeders

Battery Chargers

CIRCLE INFORM-A-GRAM KEY NO. 82

Anyone interested in increased production, protection of machines and tooling, automating equipment and quality improvement should find a 32-pager from Machinery Electrification, Inc. worthwhile. Title of the booklet is "Cutting Production Costs with an MEK Load Control." C58.

Bulletin 12D introduces the new H & G style 152 DMS die head with five chasers and cites advantages of five chaser heads over four chaser heads. Circle Inform-A-Gram No. C59 for this brochure from Eastern Machine Screw Corp.

Complete specifications and details on a new double-end internal grinder are furnished in a folder from Bryant Chucking Grinder Co. Inform-A-Gram No. C60.

Bulletin R-206 from R. K. LeBlond Machine Tool Co. tells the story of the 21 and 24" Regal engine lathe. Check Inform-A-Gram No. C61 for your free copy.

Space Age Measurement to be Advanced

An Institute of Metrology has been established to introduce students to the modern requirements for precision measurement demanded by space age technology. Comprehensive one-week courses in linear metrology are being conducted under the direction of John A. Harrington, noted author and lecturer in the field.

In addition to using many common laboratory instruments, the students will be introduced to a Zeiss interferometer and link fringe count micrometer capable of measuring to one-tenth of a millionth of an inch.

Subjects covered in the training course include: necessity for standards, traceability and government requirements, derivation of standards, human factors in standards, instrumentation, comparative instruments, absolute instruments and sources of error.

Each class is limited in enrollment to assure each student full opportunity for individual participation.

Additional information concerning MetroLonics Institute of Metrology is available from MetroLonics, Inc., 2201 N. Hollywood Way, Burbank, Calif.

AUTOMATICALLY

The Model 90FS Universal Automatic Flute Grinder

MAKES TOOLS With Straight or Spiral Flutes IN MINUTES

Saves Money Because

FLUTED TOOLS
Cutters • Millers • Taps • Reamers

MADE AUTOMATICALLY are Economical

Get details on Miller and Grinder

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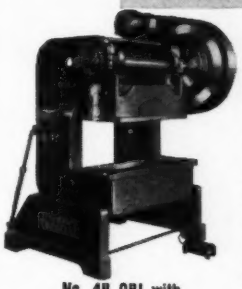
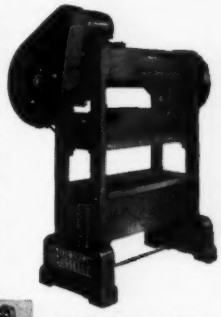
High-Output with ROUSSELLE
DOUBLE-CRANK PRESSES



No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



STRAIGHT SIDE – Die space up to 24 in.; bed space up to 6 ft. between uprights.

Choice of over 30 models and types in 5 to 60-ton sizes

SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
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Rousselle Presses are sold exclusively through Leading Machinery Dealers.

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BRINELL

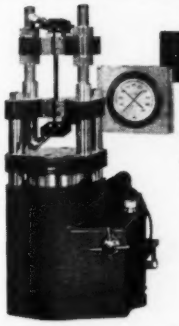
Standard Brinell testing machines. Direct reading, long stroke, and many other modifications available.

Special Models Too!

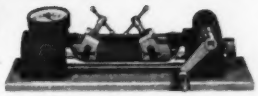
DUCTILITY

Hydraulically powered 3/16-inch capacity sheet metal testers have up to 30,000-lb. load.

FOR THE BEST BUY DETROIT TESTING MACHINES



TENSILE



Hand-operated portable tensile tester has 4,000 lb. capacity. Hydraulic bench models have up to 40,000-lb. capacity.

Write today for more information.

DETROIT TESTING MACHINE COMPANY
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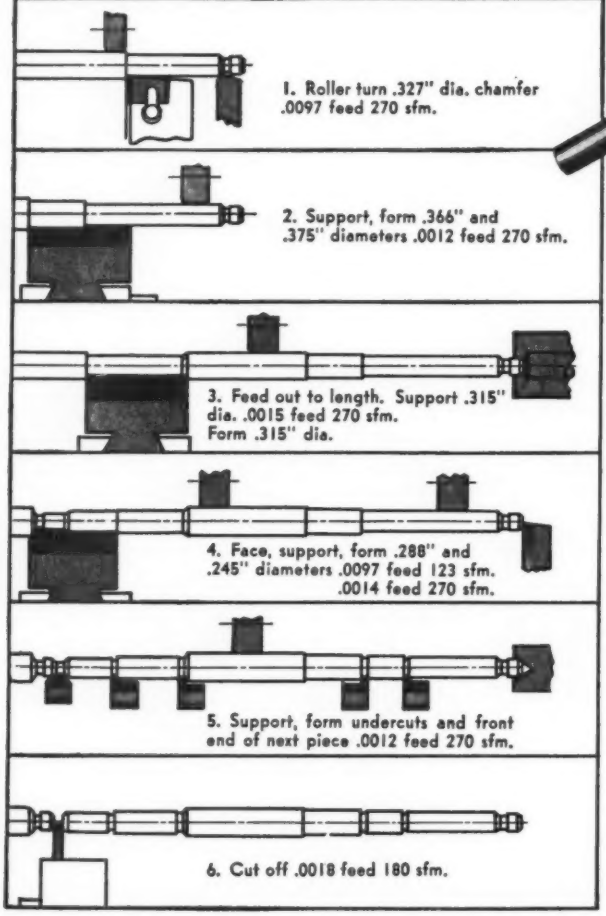
CIRCLE INFORM-A-GRAM KEY NO. 833

GREENLEE AIR-FEED AUTOMATICS BENEFIT "ELECTROLUX" FOUR WAYS . . .

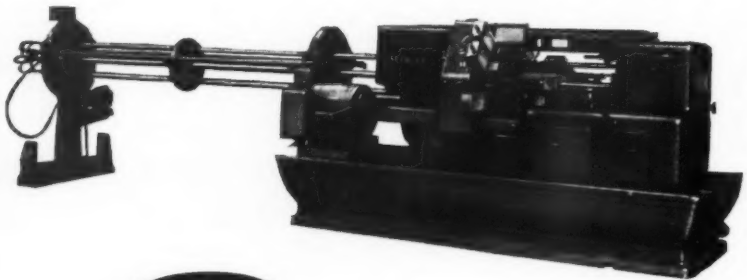
MACHINE . . . 1"-6 Automatic Bar Machine Air-Feed — Feedout on index and in 3rd position during machine cycle. TOOLING . . . Carbide Tipped MATERIAL . . . 1137 STOCK SIZE . . . 13/32" rd.	TOOL SLIDE STROKE . . 1-9/16" at .0097" feed. SPINDLE SPEED . . . 2540 rpm 270 sfm. MACHINE TIME . . . 5.8 seconds. ESTIMATED GROSS PRODUCTION . . . 620 per hour


1. Roller turn .327" dia. chamfer .0097 feed 270 sfm.
2. Support, form .366" and .375" diameters .0012 feed 270 sfm.
3. Feed out to length. Support .315" dia. .0015 feed 270 sfm. Form .315" dia.
4. Face, support, form .288" and .245" diameters .0097 feed 123 sfm. .0014 feed 270 sfm.
5. Support, form undercuts and front end of next piece .0012 feed 270 sfm.
6. Cut off .0018 feed 180 sfm.

1. Eliminate stock pushers . . .
2. Eliminate scoring of stock . . .
3. Reduce downtime during set-up . . .
4. Provide extra length feed-out . . .

The part is a 6-7/8" long armature shaft used in the "Electrolux" vacuum cleaner. It demonstrates how effectively Greenlee Air-Feed Automatics and carbide tooling can team-up to increase production and reduce costs. The shaft is machined from 13/32" S.A.E. 1137 steel at a gross production rate of 620 pieces per hour. Recommended cutting speed for high speed tooling is 120 sfm. The rate was boosted to 270 sfm with carbide-tipped tooling. Sequence of operations is shown at the left.

Note how the stock is partially fed out on the index and to its full length in the third position. This provides for the most effective tooling arrangement. Greenlee Air-Feed Automatics permit greater job versatility and assure added profits. See your Greenlee representative or send us a print of your high-cost problem-part.



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GREENLEE BROS. & CO.

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TRANSFER MACHINES • SPECIAL MACHINES • AUTOMATIC BAR MACHINES • WOODWORKING MACHINES AND TOOLS • DIE CASTING MACHINES • TRIM PRESSES • HYDRAULIC AND HAND TOOLS

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for JUNE 1961

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13	26	40	74	671	871	932	962	1061	1102	1152	1193	

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C5	C14	C23	C32	C41	C50	C59	P5	P14	P23	P32	P41	P50
C6	C15	C24	C33	C42	C51	C60	P6	P15	P24	P33	P42	
C7	C16	C25	C34	C43	C52	C61	P7	P16	P25	P34	P43	
C8	C17	C26	C35	C44	C53	D1	P8	P17	P26	P35	P44	
C9	C18	C27	C36	C45	C54	D2	P9	P18	P27	P36	P45	

Which article in this issue interested you most? _____

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12	25	38	73	400	833	931	961	1053	1101	1151	1192	
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EDITORIAL ITEMS

C1	C10	C19	C28	C37	C46	C55	P1	P10	P19	P28	P37	P46
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C5	C14	C23	C32	C41	C50	C59	P5	P14	P23	P32	P41	P50
C6	C15	C24	C33	C42	C51	C60	P6	P15	P24	P33	P42	
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C8	C17	C26	C35	C44	C53	D1	P8	P17	P26	P35	P44	
C9	C18	C27	C36	C45	C54	D2	P9	P18	P27	P36	P45	

Which article in this issue interested you most? _____

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why Ampex uses NIKON OPTICAL COMPARATORS

The new Ampex AR-300, developed principally for military and scientific applications, is the only recorder capable of covering a 4-megacycle bandwidth. It can capture and record phenomena beyond the range of any equipment in use today.

The most vital component in the AR-300 is its rotating recording head, designed to achieve the high, head-to-tape velocity required for wide band response, yet maintaining a relatively low, reel-to-reel speed.

Nothing in the manufacture of the AR-300 proved as critical as the production of this head. Most of its parts did not lend themselves to conventional inspection methods. While .0001" tolerances had to be maintained, Ampex standards call for inspection equipment capable of at least 10 times the required accuracy.

This inspection problem was finally solved when the task was assigned to a Nikon 6 Optical Comparator. Not only did the Nikon Comparator provide the exact measurements required during 'in-process' inspection, but it also permitted consistent duplication of these measurements, time after time.

Today, the Nikon 6 has a permanent position on the AR-300 production team. Furthermore, there are now five additional Nikon comparators serving Ampex in other production projects, and in development—helping to maintain the high quality standards for which Ampex products are justly famous.

Why not investigate what a Nikon comparator can do for you? Write for complete, illustrated catalog to Dept. TP-6.

NIKON INCORPORATED, 111 FIFTH AVE., NEW YORK 3, N. Y.

Ferrite Coil Under Inspection Showing Size Relationship

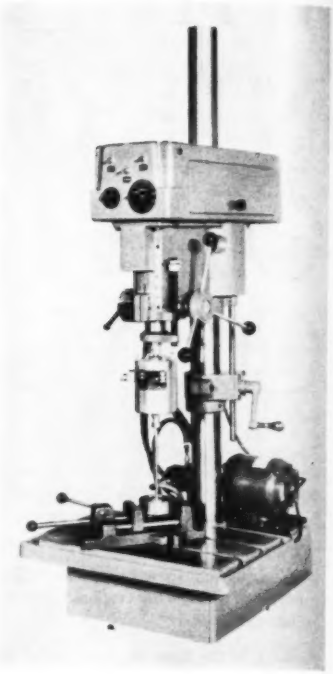
T&P Product News

Carbide End Mills

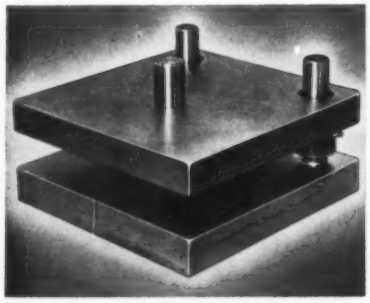
A new carbide end mill for high alloy steels is made of special grade carbide to withstand shock, and is ground to a super-finished edge with negative rake. Available in sizes 1/32 to 3/4" dia, the end mills are preformed for economy. Write the manufacturer Starlite Industries, Inc., 58th & Market Sts., Philadelphia 39, Pa., or circle Inform-A-Gram No. P1.

Broken Tap Remover

You may not have Aladdin's lamp, but you can disintegrate broken taps, drills, reamers, etc. to remove them from holes in machined parts, castings, or dies. The newly perfected machine for doing this is entirely self-contained, essentially a bench model, but available with a portable cabinet which converts it into a floor model. For exceptionally large castings, the head can be removed and chucked into a radial drill with only a simple grounding required between the two machines. For further description, write Jiffy Tool Supply Co., Inc., 1503 E. 11 Mile Rd., Royal Oak, Mich., or circle P2.



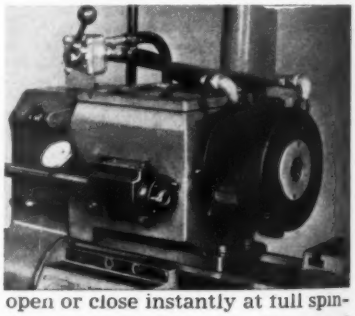
Steel Die Sets



All steel die sets in 216 different combinations of sizes and thicknesses are now available in standard models. The torch cut die sets are suitable for most precision requirements. They're equipped with hardened and honed Lamina steel shoulder bushings, hardened, ground and lapped Lamina tool steel guide pins and grease fittings. Wheatley Economy Die Sets, Inc., 1627 W. Fort St., Detroit 16, Mich. ships the die sets completely assembled. Write them, or circle Inform-A-Gram No. P3.

No Spindle Stopping

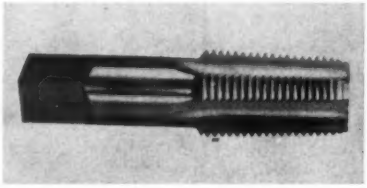
Airflex collet Actuator closes and releases flexible rubber collet chucks without stopping the spindle. The unit consists of the actuator cylinder, spindle sleeve and nose piece, and threads onto any 2¼ x 8" threaded lathe spindle. The actuator produces a grip 22 times greater than air line pressure with a ¼" stroke. Chucks



open or close instantly at full spindle speed. Positive length control is obtained through use of a fixed stop in the hollow spindle. No actuator bar is needed, and full 1⅜" spindle capacity is available for feeding bar stock or for rapid ejection equipment. Write Wil-Numat Corp., 411 S. Hindry, Inglewood 1, Calif., or mark Inform-A-Gram No. P5.

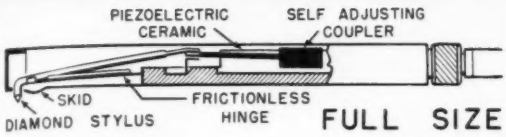
Fine Pipe Threads

New Besly Taper Pipe taps are recommended for use with most stainless steels, steel forgings and castings, low carbon steels, leaded steels, free-machining steels, zinc and aluminum die cast, aluminum and some bronzes. The taps are credited with minimizing stop lines, producing an accurate thread and assuring pressure-tight joints.



Longer tool life and uniform cutting action are also claimed by Besly-Welles Corp., South Beloit, Ill. Write them, or check Inform-A-Gram No. P4.

SURFACE FINISH MEASUREMENT



PICKUP DESIGN

The heart of any surface finish measurement instrument is the pickup. This component determines the performance and versatility of the gage. The above design illustrates the most advanced pickup available. In many respects similar to a high fidelity phonograph cartridge, it employs a piezo-electric ceramic element, which is unaffected by temperature, humidity and other environmental factors. The flexing of this ceramic converts the variations in surface finish height into an electrical signal.

The self adjusting viscous coupling assures operation from a true neutral point and prevents excessive stylus pressure without critical leveling of the pickup. This feature also reduces the number of skids required. The inherent simplicity of the pickup design reduces maintenance as well as the initial cost of the equipment. The small size of the basic pickup eliminates the need for many special types or adapters. Other pickups are available which permit measurements on very small or narrow areas, flanges, thread flanks, gear teeth, small internal diameters and "O" ring grooves.

All other Roughness Meter items, amplifier, mechanical trace and skidless trace, make use of similar advanced designs.

Write for information or a demonstration.

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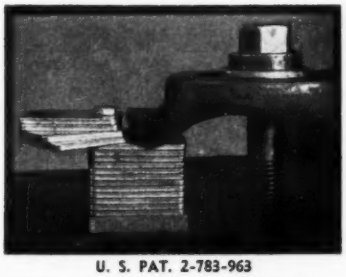

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- Drill shallow or deep holes to precision tolerances.

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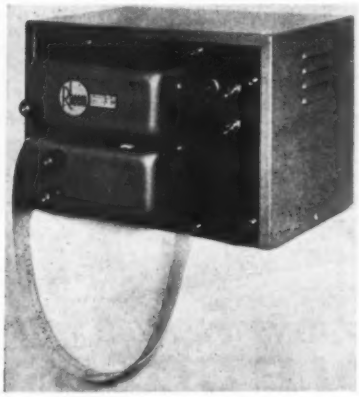
CIRCLE INFORM-A-GRAM KEY NO. 872

Product News

Photocell Reader

Originally designed for use with Rheem's advanced numerical positioning controls for machine tools, the reader is now available for punched tape reading. Transistorized for long life, the sensing element is one piece of silicon with eight information signals and one timing track channel. Focusing problems, often encountered with a separate photocell for each



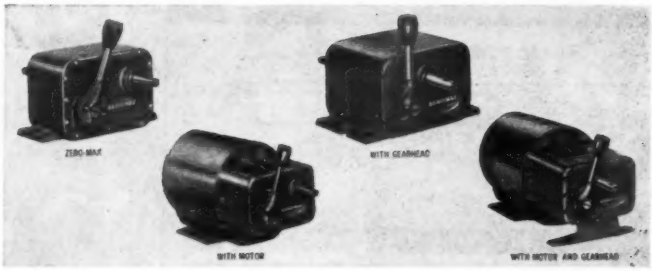
channel, are eliminated. Reading speed is 100 characters/sec, according to Rheem Mfg. Co., Electronics Div., 5200 W. 104th St., Los Angeles, Calif. Inform-A-Gram No. P6.

Missing Parts Detector

Protection of expensive dies and machinery against damage or production of scrap because of material or a part being out of place, is afforded by a new missing parts detector. The new unit features a high-impedance feeler assembly that's not affected by water, oil, and other substances. The detector automatically senses non-ejection, misfeeding, buckling, end-of-material and overloading, and stops equipment instantaneously.

For complete literature, write Wintriss Controls, Div., Industrionics Controls, Inc., 20-24 Vandam St., New York 13, or circle Inform-A-Gram No. P7.

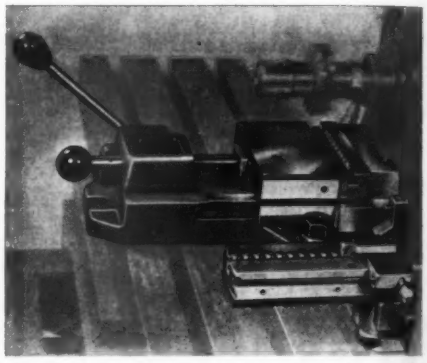
Variable Speed Drives



Series 400 redesigned Zero-Max variable speed drives for fractional hp applications show important improvements in Zero-Max drives. Built-in overload protection with safety disconnect, a new lever control for fast and precise speed setting with no slippage and improved venting of motor, which decreases heat rise are featured. Also new is a larger input shaft on the smaller models for easier adaptation of pulleys and accessories. Write the Zero-Max Co., 2845 Harriet Ave. So., Minneapolis 8, Minn., or check Inform-A-Gram No. P8.

Vise Debut

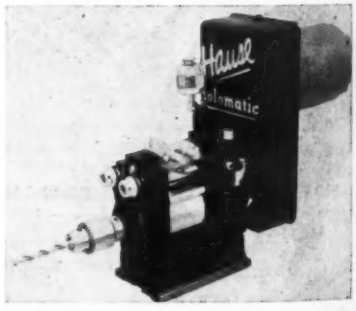
A new gang vise, used on a miller, having air feed and which turns out 10 pieces in 25 sec in a complete cycle, features a new compensating jaw assembly that assures even and powerful pressure on a multiple number of pieces although varied in size. Springless clamping and compensating cams transmit unlimited positive line pressure. The easily removable and replaceable work compensating jaws can be ground to hold special shapes with extreme adaptability. In stock are a number of jaws for holding from six-



teen ¼ pcs to four of 1" dia. All parts are interchangeable. Write Lassy Tool Co., Plainview, Conn. Inform-A-Gram No. P9.

Speedy Drilling and Tapping

Drilling efficiency is now assured with fast-acting, quick setting and accurately traveling Holomatic units. The Models 22, 42 and 62 are designed for automatic drilling, tapping, threading, facing etc. They can be used as components on special machines individually or grouped. They come in three power and feed styles: air hydraulic, balanced air and hydraulic. A work range covers ⅜" dia in steel and 1" dia in wood with a tap capacity of 7/16-14 in steel. For more information on these



units (with spindle speeds of 400 to 8000 rpm and 4000 to 20,000 rpm with speed increaser) write Hause Machines, Inc., or circle Inform-A-Gram No. P10.

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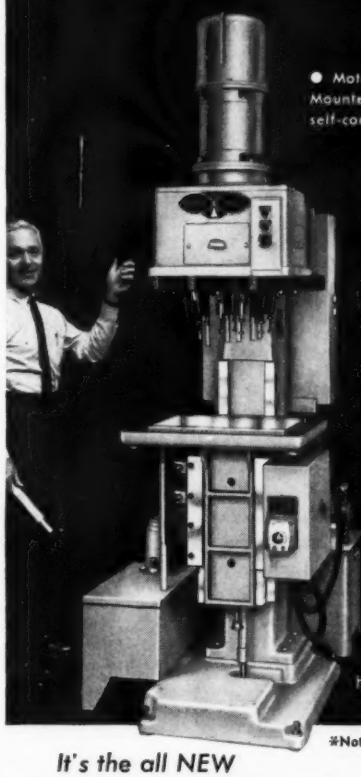
new! UP TO 60 TAPPING CYCLES A MINUTE!



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- Adjustable arm and bracket type spindle assembly.*
- Table and knee assembly adjusts 14" along column.
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CIRCLE INFORM-A-GRAM KEY NO. 894

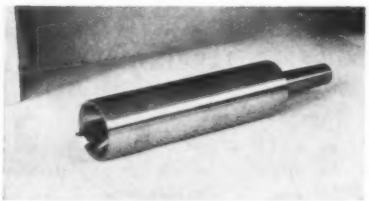
Product News

Bridled Brushes

Structural steel shops and many other heavy-duty metal-cleaning tool users will be interested in a new line of bridle-equipped wire brushes from Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio. To assure faster cut and longer life for metal finishing and

cleaning, the bridles compress the brush face for a greater cut and reduction of flare. They are especially designed for use with highspeed air and electric tools. For weld scale removal, tank and drum cleaning, corrosion and rust removal, structural steel cleaning and paint removal and a host of other applications, the bridle is easily removable. Write the company for Bulletin 334, or mark Inform-A-Gram No. P11.

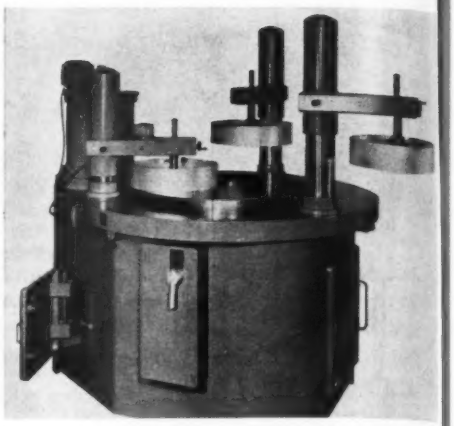
Self-Centering Tool



A new funnel-nosed tool will self-center round, square or rectangular stock and center drill it for machining or grinding. It can be used for center drilling, center reaming, pipe reaming etc. The spring-loaded tool's outer housing holds stock firmly in position as spring pressure is forced against the stock. In a lathe the outer housing rotates with the works, while the inner shaft containing the center drill is locked in the tail stock. The procedure is reversed in a drill press. Write The Raymond Paslawsky Co., 201 Morehouse Hwy., Fairfield, Conn., or circle Inform-A-Gram No. P12.

Flatness in Lapping

Extreme flatness and microinch surface quality in lapping and finishing piece parts on a volume basis can be accomplished without awkward holding devices or magnets with a new 36" Gyro-Matic precision flat lapping machine. Model SP-F888-36PN features pneumatic lifts which automatically apply correct pressure for lapping a wide variety of materials. Spitfire Tool & Machine Co., 2931 N. Pulaski Rd., Chicago 41, Ill., or Inform-A-Gram No. P13.



New Twist In Drill Bushings

You can now eliminate a separate lock screw for anchoring slip renewable-type drill bushings in place by using the ingenious new Un-A-Lok lock liners. These come with ground or unground OD, or with special knurled OD for use in plastic tools. Permanently installed, they accept the standard bushing which is locked in or removed by a simple finger-tip twist. During drilling, the bushing is retained securely by rotation of the drill.

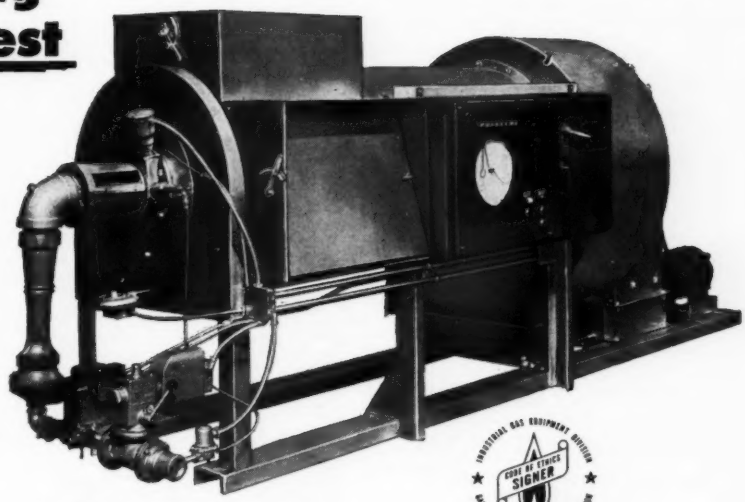
Use of the new lock liners precludes necessity for costly layout, drilling and tapping of lock screw holes — thereby reducing tool costs and speeding completion of tooling. For the new American catalog, listing the liners write to American Drill Bushing Co., 5107 Pacific Blvd., Los Angeles 58, or circle Inform-A-Gram No. P14.

Perfect Holes

Model VT-1 hand tapping machine is said to produce tapped holes quickly. The unit allows extreme flexibility in tapping and great freedom of action. An operator can instantly swing the tap to any point on the table and even beyond it in case of large parts and overhanging fixtures. A floating arm glides the tap into true hole center without pushing or tugging, and the counterbalanced column is raised or lowered instantly and effortlessly. The tapping machine requires low torque, reduces lead distortion, produces straight holes and eliminates tap breakage. Write Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn., or mark Inform-A-Gram No. P15.

Heat Processing at its best with NEW G. A. S. UTILITY AIR HEATER

A complete package unit, modern as tomorrow in both design and performance, this new direct gas-fired line of industrial heaters comes to you complete with control cabinet, temperature and safety instruments, fan and motor, wired for immediate operation. Can be furnished for remote control wiring. Capacities range from 125,000 BTU's/hr., to 4,000,000 BTU's/hrs.,—temperatures to 600°F. in standard models and to 1,000°F., in famous G.A.S. Rapidry Models. Features injector type atmospheric type burners (combination gas-oil burners when desired), heavy-duty industrial type blower, and electrical ignition. Exceptionally quiet operation.



Model 409H illustrated.
Capacity 2,000,000 BTU's/hr.
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Machining Consultant

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Tool Life Formulas . . . Tool Life Criterion . . . Chip Load and Workpiece Hardness . . . Tool Geometry . . . Test Records . . . Tool Inspection . . . Machinability Classification . . . Machine Tool Selection.
The Manual contains a wealth of examples and forms for Development Sheets . . . Recommendation Sheets . . . Crossed Charts . . . Tool Life Tables . . . Graphs and Drawings . . . covering work with Carbides and HSS on Cast Iron and Steel.
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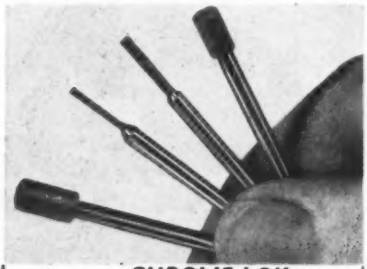

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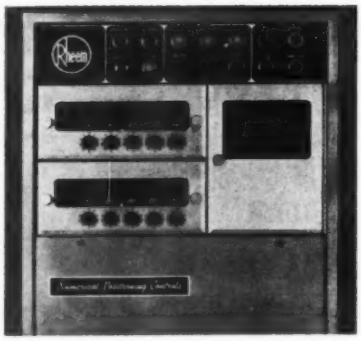
Product News

Ultrasonic Cleaner

Maxson is L & R Mfg. Co.'s answer to the need for an economical ultrasonic cleaner. The new unit has a full 1¼ qt capacity, and is designed to clean a large volume of large pieces faster, more efficiently, more economically. A built-in electronic circuit transmits power directly from the transducer to the cleaning tank. The unit needs only an 8 x 6" space. It plugs in for immediate operation. Power output is 45 watts, power consumption 140 watts and operating frequency is 70-80 kc. Write the manufacturer

at 577 Elm St., Kearney, N.J. Inform-A-Gram No. P17.

Automatic Control of Bore Diameter



Machine tool automation has become reality to many more companies thanks to a new numerical positioning control system made by the Electronics Div. of Rheem Mfg. Co., 5200 W. 104th St., Los Angeles 45, Calif.

The system is the first to achieve automatic control of bore diameter while the spindle rotates. It distributes tape information electronically and eliminates less reliable stepping and crossbar switches. Of modular construction by axes, it allows a choice of resolutions, high positioning speeds, feed rate controls, larger travel distances, decimal display of tape information, automatic, semi-automatic, and manual modes, as well as unlimited auxiliary functions. Write Rheem Mfg. Co., or circle Inform-A-Gram No. P16.

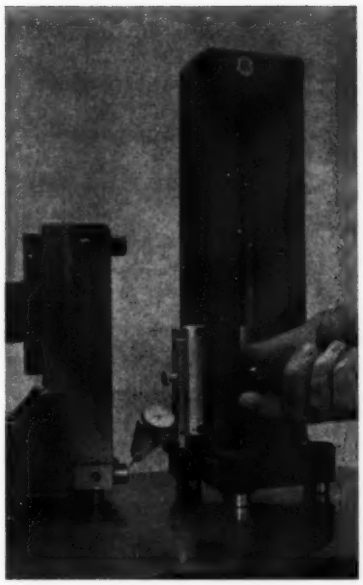
Oiling Die Stock

A new line of hydraulic spray nozzles features a clean-out needle that automatically clears the orifice with each on-and-off cycle. This is done by means of a clean-out needle extension of the orifice shutoff valve. Upon each closure of the valve the clean-out needle goes into action clearing any solid residue. The precision air cylinder actuating mechanism can be operated at any speed up to 180 cycles/min. The spray nozzles should be particularly useful for oiling die stock, etc. Nozzles are supplied in a choice of interchangeable orifice tips from Spraying Systems Co., 3201 Randolph St., Bellwood, Ill. Ask for Data Sheet 8651, or mark Inform-A-Gram No. P18.

Product News

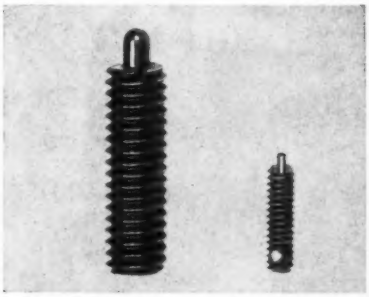
Precision Indicator

Indi-Square is a new instrument that works equally well with general indicating equipment or with electronic indicating devices. Tool inspection, toolroom, gage making, quality control personnel, and many others should find the indicator indispensable. Hard-to-get-at areas such as cavities and slots are also in the unit's domain, and it's credited with squareness and straightness indication as close as 0.0001 in 16". After aligning Indi-Square to the work, the indicating head can be raised and then lowered for easy readings. Any error in squareness and straightness is immediately located without guesswork or complex clamping. The head is spring loaded to eliminate play or shake and the master bar can be adjusted from front to back and side to side in seconds. Write the Indi-Square Co., Inc., 1119 East Ridge Rd., Rochester 21, N.Y. Inform-A-Gram No. P19.

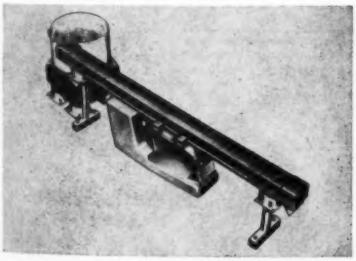


Locks Tight

Set screws or other expensive methods of locking spring plungers have been superseded by Nylock. When a spring plunger is in place, compression of the Nylock nylon pellet creates a spring-like wedging action which locks the mated threads together. The self-locking torque of Nylock inserts permits quick, easy assembly and a positive vibration-free lock. The spring plungers come in thread sizes from 6-32 through 1 to 8". Nylock pellets are incorporated in the complete line of spring plungers for dies, jigs, fixtures and detents from Harco Engineering, 12092 Woodbine Ave., Detroit 39, Mich. Write them, or circle Inform-A-Gram No. P20.



Moving Small Parts



Moving small and even minutely formed parts will be simple with Vibra-Drive. The unit provides an easy way to apply directional vibratory conveying movement to a cushioned track, a level or inclined trough or responsive surface. It's ideally suited for operation in conjunction with processing and assembly machines. The Vibra-Drives are electromagnetic vibratory motors operating from a rectified 60 cycle AC producing 3600 vibrations/min. Power or amplitude of vibration is regulated from high to low by a rheostat knob. Complete information from Syntron Co., 341 Lexington Ave., Homer City, Pa., or No. P21.

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MICROMETER INDICATOR REPAIRING
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LIFTING DEVICES
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Hole Sizes—No. 80 to 3/32"
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CAM CALCULATING SERVICE
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MAGNETIC BASE TOOL HOLDER | 21 MAGNETIC TOOLS | 11 PERMANENT MAGNETS—VARIOUS SIZES AND TYPES

Indicator Holder - 1/4" dia. non-magnetic stainless steel rod complete with 5/16" and 3/8" O. D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning. Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

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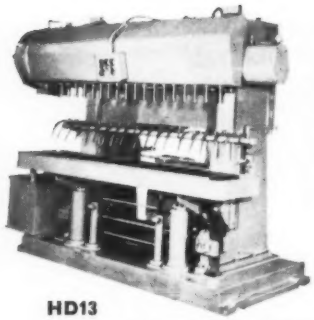
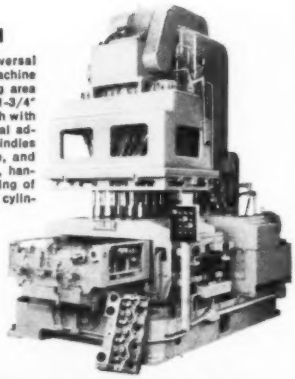


HD13

straight line drilling machine with hydraulic table feed and 18 spindles each having 11/16" diameter drill capacity in mild steel. Spindle center distances are adjustable along the 6-foot machine rail.

MODEL HU111

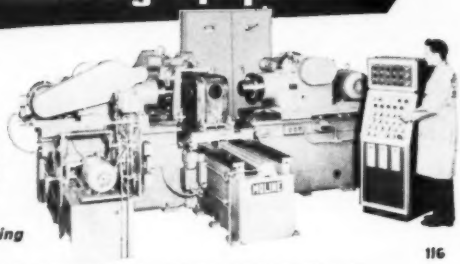
Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 50" drilling area and with forty-two 1-3/4" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.



MOLINE Cost Reducing Equipment

MODEL MR148

Three-way, three-spindle, horizontal boring machine with selective automatic feed cycle. Handles boring of cylinder and crank bore for 3 sizes of 1-cylinder blocks. Also bores for wet sleeves in 2- and 3-cylinder blocks.



60 years of Machine Tool Engineering Experience is at your service for 116

- Multi-Spindle Boring • Single and Multi-Spindle Honing
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- Special Multiple Operation Machine Tools *Write for Details*

MOLINE TOOL COMPANY
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REPRESENTATIVES IN PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 941

A TURN FOR THE BETTER

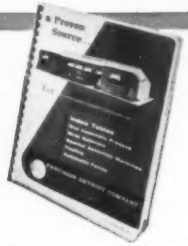
DIAMETER
15″

NUMBER OF STATIONS

Standards:
*3, *4, 6, 8, 12

Specials:
*5, 7, 9, 10, 11

*skip station units



PDC-AM—15″ SERIES
"AUTOMATIC"
Geneva Motion Index Table

COMPLETE with air motor, solenoid valve, limit switch, 3 relays and enclosure, airline oiler and airline filter . . . all that is necessary to interlock it with other automatic equipment.

MODIFICATIONS available with Electric Drive, Fluid Drive or vertical mounting.

Write TODAY for new Catalog 60, for designers and engineers

PRECISION DETROIT COMPANY
20100 SHERWOOD • DETROIT 34, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 942

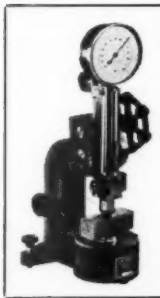
Product News

Fast Load Drill Fixture

You can load and unload work faster with a Lift Swing drilling fixture, one of the featured products on display by Accurate Bushing Company. The fixture's top plate lifts and swings completely out of the way. Simplicity of design and interchangeable components permit tooling a job quickly and economically. In many cases,

the fixture can be put directly on a jig borer or other machine for addition of features required for a specific job. The fixture can be used for tumble jig work and many other applications.

Substantial savings can be made in design and fabrication of many jigs and fixtures by the use of Accurate's standard machined cast-iron sections. These come in any length up to 25.00, with cross-sections of U, L, T (equal or unequal), H, flat, square hollow or rectangular hollow shape. Write to the company, at Garwood, N.J., or circle Inform-A-Gram No. P22.



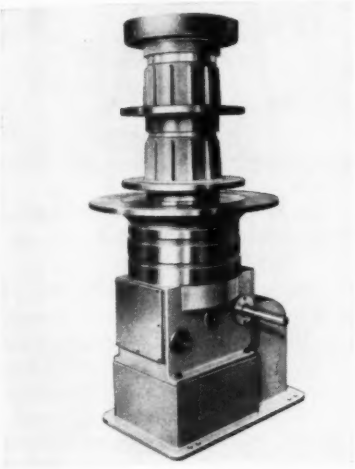
HARDNESS TESTING
has been done with the **SCLEROSCOPE**
Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 943

Product News

Turret Indexing Machine Chassis



A new turret indexing chassis Model SD employs a dual-motion method of multiple-piece part assembly, and comes in a wide range of turret diameters, index positions and work cycles. It's suited to relatively light sequential machining, assembling and processing operations. Most of the tooling is mounted on and actuated by a pair of tool plates center-mounted above the indexing turret. The plates move up and down with definite relative motion since they are cam-actuated in synchronization with the main indexing cam shaft. Additional hoppers and processing equipment may be mounted on external mounting brackets around the outside of the turret. Swanson-Erie Corp., 814 East Eighth St., Erie, Pa., has all the answers, or circle Inform-A-Gram No. P23.

DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
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2303L North 11th St. • St. Louis 6, Mo.

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Producto's New DIE ASSEMBLER

Hydraulically actuated lift table; upper platen revolves 360°, develops 3000-lb. closing force and 1500-lb. separating force. Battery-driven; mobile, no trailing wires. Invaluable in the manufacture and repair of dies. Write today:

TOOLROOM EQUIPMENT DIVISION

THE PRODUCTO MACHINE COMPANY

945 Housatonic Ave., Bridgeport, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 953

Both NEW and DIFFERENT SHELDON 15" PRECISION LATHES

NEW

New. Revolutionary double-box Headstock (Pat. Pend.)
New. "WORK-HOLDING ONLY" Spindle.
New. Single-Shift Back Gear Lever on Headstock.
New. Headstock and Apron running in oil.
New. 1⅛" Hole through Spindle.
New. 60-pitch Gear Box with built-in Lead Screw Reverse.
New. Amazing LOW PRICE.

DIFFERENT

Different. Spindle rigidly held in two large "Zero Precision tapered roller bearings arranged in box-type design.
Different. Electrical switches and push-button stations fully enclosed in built-in well in headstock.
Different. Two independent clutches in apron for selecting power feeds.
Different. Cam-action tailstock clamp for rapid release and instant locking of tailstock.
Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

Send in Coupon for full Information ↓

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Gentlemen: Please send me information on items checked.

( ) The NEW and DIFFERENT SHELDON 15" Lathes ( ) 13" Lathes
( ) Sheldon ( ) 10", ( ) 11" ( ) 12" Lathes
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( ) Sebastian 13" and 15' Geared Head Lathes
( ) Horizontal Milling Machine
( ) Sheldon 12" Shaper
( ) Name of Local Dealer
( ) Have representative Call

Name_____ Title_____
Company Name_____
Street Address_____ ☐ Company ☐ Home
City_____ State_____

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DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS

Wilmerding, Penna.

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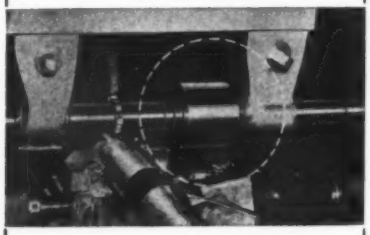
ELIMINATE MILLING MACHINE MAINTENANCE



UPS FEEDS AND SPEEDS 200%

See how General Electric, Jeffrey Mfg., hundreds of others absolutely end arbor bushing maintenance problems and decrease production costs on horizontal milling machines by replacing the bronze outer support bushing with a Jergens "Live" Sealed Roller Bearing Unit. Jergens Units with adjustable roller bearings hold precision—permit increases in milling speeds and feeds to take full advantage of carbide cutters. The rigidity of these units increase cutter life and eliminate chatter, frozen bushings, and twisted arbors. See how hundreds save thousands! Write for FREE case histories of actual company performance reports of jobs and dollars saved.

DONLEY PRODUCTS, INC.

Dept. TP-6 11106 Avon Ave., Cleveland 5, O.

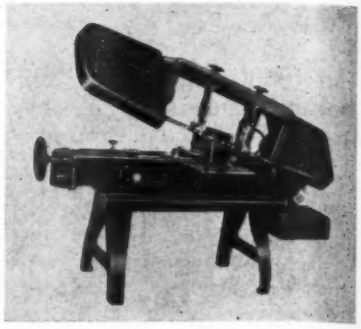
CIRCLE INFORM-A-GRAM KEY NO. 961

Product News

A Powerful Midget

A minute dual - purpose Liquid Spring Shok weighs a mere ounce, but absorbs 175 in-lbs of energy and provides 800 lbs spring force. The 800 lbs preload to 0.04 stroke with 400 lbs preload. Model 409.8SS Liquid Shok Spring at present holds the record as the smallest of the Taylor Devices, Inc., line of more than 80 standard models of Liquid Spring Shoks, dash pots and springs providing up to 8,860,000 in-lbs energy absorption and 1 million lbs spring force. Write Taylor at 200 Michigan Ave., North Tonawanda, N.Y. for handbook CH1, or check Inform-A-Gram No. P24.

Cuts at Regular Speeds



Model L-9 horizontal cutting band saw, previously offered only with variable speed drive, is now available as a standard model with a new 4-way speed drive. Speeds are 50, 90, 120 and 260 fpm. Both models of the L-9 saw are hinge type with cutting capacities of 9 x 16". The unit is intended for maintenance work where cutting speed is now critical, or for production cutting on common materials where variable speed is not necessary. Literature is available from W. F. Wells & Sons, Inc., Three Rivers, Mich., or through Inform-A-Gram No. P25.

ELIMINATE WEAR ON YOUR COSTLY DIE SETS

WITH INEXPENSIVE

ACRO

LEADER PIN OILERS

Pin oilers in place on die set.

These simple, inexpensive pin oilers fit over each leader pin and seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and upward stroke distributes oil evenly over leader pins. You'll eliminate bushing wear, leader pin scoring, and maintain die accuracy with these oilers.

Order today. Prices shown are F.O.B. Milwaukee.

Pin dia. ⅞", 1" or 1⅛"	Pr.	$ 6.50
Pin dia. 1¼", 1½" or 1¾"	Pr.	8.00
Pin dia. 2"	Pr.	10.00
Pin dia. 2½"	Pr.	12.00
Pin dia. 3"	Pr.	14.00

FREE FACTS covering four more money saving accessories for your plant are included in this new folder. Write today. Ask for bulletin TP59.

ACRO METAL STAMPING COMPANY

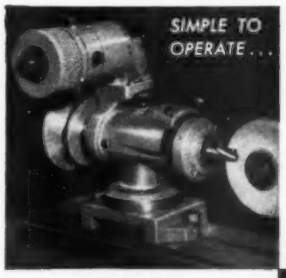
338T E. Reservoir Ave., Milwaukee, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 962

GRIND YOUR OWN TOOLS...

SAVE AND IMPROVE!

TWIN FIXTURES TO SHARPEN VIRTUALLY EVERY TYPE OF TOOL IN YOUR PLANT!



NO SPECIAL OPERATOR SKILLS REQUIRED!

HARIG STEPTOOL

RELIEF-GRINDING FIXTURE

- CAM-RELIEF GRINDER
- DRILL POINTER

Versatile, dual-purpose grinder for an endless variety of tools. Fits any tool and cutter, or surface grinder. FAST: step a ⅜" drill in 5 min. . . . sharpen tap in 20 sec. . . . grind *HELIXPOINT* in 3 sec.

ENORMOUS RANGE: 1/64" thru 1 1/32"

HARIG

AIR-FLO FIXTURE

END-MILL & MILLING CUTTER SHARPENER

Spindle "floats on a cushion of air"! . . . super sensitive, ultra precise, jerk-free, easy to use! *Speeds* and improves sharpening of end-mills and all types of milling cutters . . . small tools 1/32" up to 1¼" shank capacity.

WRITE FOR BROCHURES!

Harig *Manufacturing Corp*

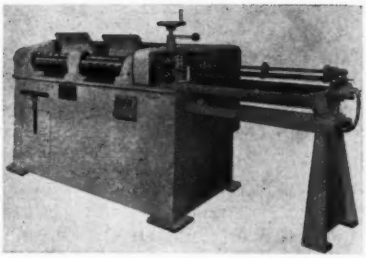
5761 Howard Street • Chicago 48, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 963

Product News

Faster Cuts

A new group of machines produces high tensile wire from 19 gage to 3/32" dia and up to 1/8" dia soft basic wire. They're credited with a 100% speed increase over previous machines. The new Shuster Model 300V variable speed twin arbor automatic "torsion" wire straightening and cutting machine includes two counter rotating and 5-station high speed straightening arbors mounted on ball bearings. It also features



Reeves variable speed unit for infinite feed range for any application. More about this high speed cutting machine (12,000 cuts/hr up to 8") from Mettler Machine Tool Co., Inc., Blvd. Industrial Park, New Haven 4, Conn., or Inform-A-Gram No. P26.

Explosion-Proof Valves

A group of solenoid valves for hydraulic system applications is designed for pressures up to 2000 psi with an inlet of 3/32" and cylinder orifices with 1/8" NPT. These valves are suited as two-way normally open or normally closed valves, as three-way normally open, normally closed, or dual purpose valves. Series X10 is stainless steel, direct acting, slide type from Skinner Electric Valve Div. Skinner Precision Industries, Inc., New Britain, Conn. Write them for particulars, or circle Inform-A-Gram No. P27.

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- MACHINE HANDLES
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- LEVERS
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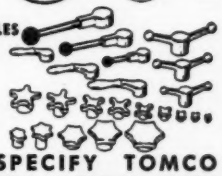

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A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

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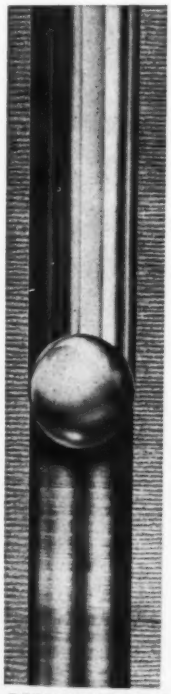

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Ballizing brings holes to size in *seconds,* with high precision and fine finish — *faster* and at *far less cost* than any other method — simply by forcing a precision ball through the unfinished hole.

This process uses *any* machine having a ram or push rod — has no close adjustments or tool maintenance — uses unskilled labor — cuts scrap and inspection costs. It saves and saves.

FREE BALLIZING BULLETIN gives full details; shows typical setups; gives cost and production data. *Write for it!*

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BALL DIVISION: 3686 JACKSON RD. ANN ARBOR 4, MICHIGAN

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for

CONTINUOUS

SMALL HOLE

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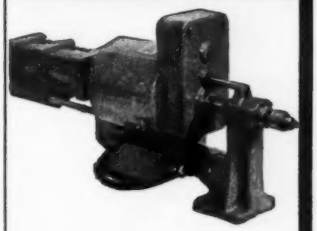

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.010 to 1/2" dia.

MODEL 111 — 3/32" Capacity
1000 to 10,000 RPM
or 2500 to 15,000 RPM
CONTINUOUSLY VARIABLE SPEED CONTROL

MODEL 113 — 1/4" Capacity
15 SPEEDS TO 15,000 RPM

MODEL 603 — 1/2" Capacity
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WITH VARIABLE SHEAVES

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The ELECTRO-MECHANO CO.

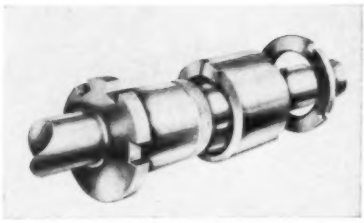
260 E. Erie Street Milwaukee 2, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 973

Product News

4-in-1 Press Stroke

Adjustable ram stroke for job-shop punch presses is obtained with a unique pitman arrangement. On the Varistroke, available on Z & H and Robinson presses up to 50 tons, the pitman is mounted on a keyed eccentric tapered bushing which can be moved and locked in any of four slotted positions.



When changing the stroke, the lock ring nut is backed off to permit the eccentric bushing to be disengaged from the locking ring and then realigned with the slot for the desired stroke. Tightening the lock ring nut presses the key into the slot for positive drive engagement.

This design feature permits one press to efficiently cover the range of four, reduces effective shut height and slide velocity, and results in lower downtime and maintenance costs. For further details, write to Dechert Dynamics Corp., Palmyra, Pa., or circle Inform-A-Gram No. P29.

Miniature Internal Grinder

A revolutionary internal grinder with completely enclosed work area has fewer moving parts, and incremental wheel compensation in a range from 0 to 0.001. The unit's vibration damped feeding cross slide provides consistent repeatability well within 0.00001. A new automatic cycle swivels both the wheelhead in line of traverse, and the workhead resulting in a more accurately sized taper. Changeover time has been reduced over previous models via direct reading micrometer type dials. All cross slide positions can be positively set from data sheets without use of dial indicators. The cross slide on this Model 090A resets automatically to new wheel dress position. A direct reading digital dial shows amount of wheel life remaining and allows the operator to plan accordingly. Write the Heald Machine Co., Worcester 6, Mass., or mark Inform-A-Gram No. P28.

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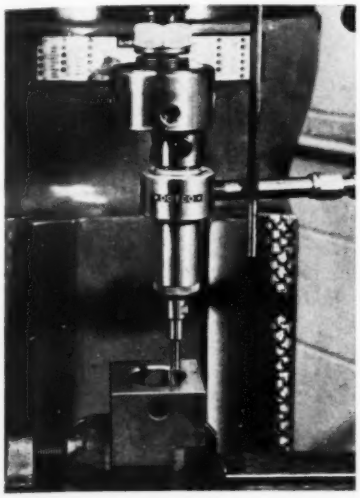
CIRCLE INFORM-A-GRAM KEY NO. 982

Product News

Grinding Tough Materials



A powerful new pneumatic unit will jig grind any size hole, before and after heat treat, and will also work on male cylindrical members. The hole grinder takes the place of the conventional boring bar and is inserted in a boring head. It can be used on vertical or horizontal mills, boring machines, lathes or jig borers at speeds up to 30,000 rpm. Fine finish and accuracy with maximum runout to 0.0005 on all collet type grinders are credited to the unit's four-vane rotary air motor and use of Erickson interchangeable collets. The Dotco grinders are available in two sizes at speeds of 25,000 or 30,000 rpm from Doeden Tool Corp., Hicksville, Ohio. Write them, or check Inform-A-Gram No. P30.

Compression Testing

Tensile and compression strength tests are easily performed by Model LPT testing machine from Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13, Mich. A unique feature is the unit's four interchangeable load cells. Each provides a different maximum load — 100, 200, 600 and 1000 lbs, with gages and graduations to match. The 115-volt electric motor-powered hydraulically operating mechanism is completely independent of the load measurement and 1000 lbs/sec operation. Two controls are provided; one for start-stop and direction of ram movement and one for speed selection. Tensile test specimens up to 3/16" thick, 1" wide, and 12" long, and compression test specimens up to 4" dia and 6" high can be accommodated. Inform-A-Gram No. P31.

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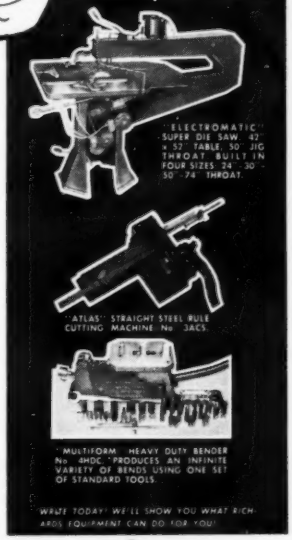
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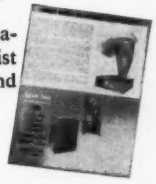
how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.



AGET Manufacturing Company
1394 Church St., Adrian, Michigan

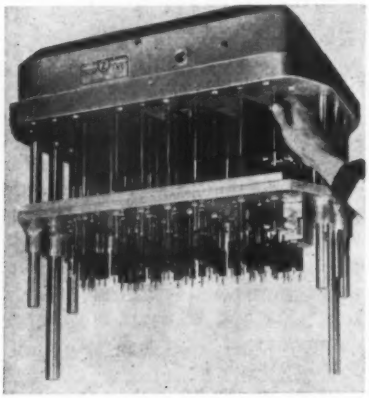
DUSTKOP STOPS DUST

CIRCLE INFORM-A-GRAM KEY NO. 992

Product News

Individual Spindle Lead Screws

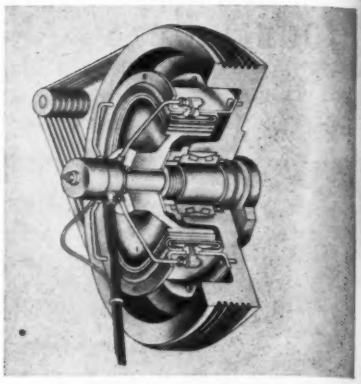
Individual spindle lead screws are now part of drilling tapping heads from Zagar, Inc., 23894 Lakeland Blvd., Cleveland 23, Ohio. Simultaneous tapping of holes with as close as 5/16" centers is possible. Spindle lead screws operate on the same close center as the spindles to which they are attached. Along with the new spindle lead screw standards, individual lead screw tapping units with



single speed or multi-speed drives are now available. The company will furnish engineering data sheets, or circle Inform-A-Gram No. P32.

Less-Wear Press Clutch

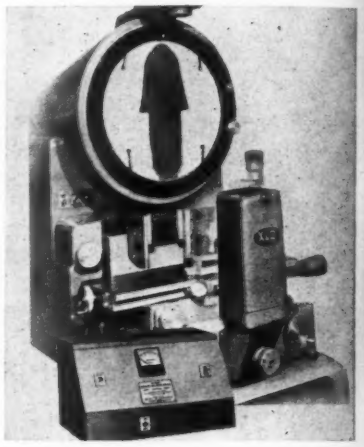
Rapid clutch action without excessive wear, and decreased pressure on crankshafts are offered by Zeh-Flex frame-supported air clutches used on the new Z & H and Robinson presses. The crank shaft passes through its quill-like bearing support, eliminating the wearing effects of the flywheel's centrifugal force and the rapid clutch action. The mechanism utilizes a 360° friction surface for instantaneous engagement and less surface heat. For full information on high speed presses with this design feature as well as adjustable



ram stroke, contact Dechert Dynamics Corp., Palmyra, Pa., or circle Inform-A-Gram No. P35.

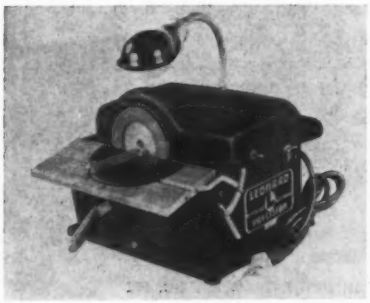
Sheds Light on Optical Inspection

To create greater clarity and sharpness of image in increased magnification, mercury arc light equipment is introduced by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. The mercury arc light has an intrinsic brightness 45 times greater than standard tungsten filament. It's recommended for 20X and over magnification on 14" projectors and 50X and over on 30" projectors. The new arc light is also suitable for lower magnifications when switched to low intensity. Write the makers, or check Inform-A-Gram No. P33.



Simpler Tool Finishing

Single head Grind-R-Lap, with quick change ring type wheels, grinds and laps carbide, HSS and ceramic tools. Wheels are held firmly and accurately by Alnico magnets set into the head, yet changes can be made without tools. The unit features a wide base protractor with an attached pivot bar that rotates 180°. It locks and sets at any angle. Once a tool to be sharpened is placed against the pivot bar, it remains in position for the entire work cycle. The oscillating pendulum wheel moves with a three-directional stroke across the tool face. The operator need not reposition the tool; he merely maintains wheel contact. Diamond plated wheel grinds cool, and needs no redressing. Write Leonard Precision Products Co., 9200 Bolsa Ave., Santa Ana, Calif., or check Inform-A-Gram No. P34.



High Speed Balancing

Armatures and rotors which require two-plane balance correction, can be dynamically balanced with Micro-Poise. This rebalancing machine provides a sensitivity of better than 0.001 oz-in, and easy setup during production. Even at its threshold sensitivity, unbalance location is still quickly and positively identified. The electronic balancing machine is made by Micro-Poise Engineering & Sales Co., 14851 Grand River Ave., Detroit 27, Mich., and is available in two models, Model BMV 3100/00 for parts weighing 1/8 to 12 oz, and Model BVM 3100/01 for parts weighing 1 to 120 oz. Write the manufacturer or circle Inform-A-Gram No. P36.

The story behind the chips

Savings In Time—Lower Tool Costs—Finer Finishes—More Accurate Cuts

Many types and sizes of *standard* Putnam End Mills are considered as "specials" by other manufacturers. Thus, Putnam customers get off-the-shelf deliveries that get their end mills on the job faster and at lower cost than "specials."

On the job, Putnam End Mills again save time and money. Designed for fast, free-cutting action, these end mills have extra long life. They will stand up when operated at high speeds and heavy feeds—on the toughest metals they really "hog-in" to quickly remove stock.

For applications requiring accurate cuts, Putnam's attention to manufacturing details and rigid quality control assures complete uniformity in each end mill. Also, users often find the exceptionally fine finishes obtainable with Putnam End Mills eliminate the need for grinding or hand finishing.

A pile of chips—the milling job is completed. But, for users of Putnam End Mills, there is always a story of unusual savings and benefits behind that pile of chips.

PUTNAM
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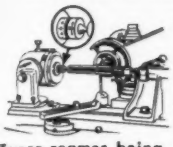
Center being used on grinder

The Enco Micro-Set® Adjustable Center



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- Quickly pays for itself in time and scrap savings

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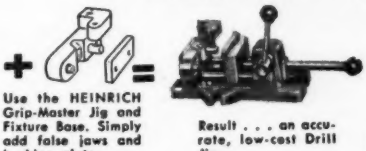

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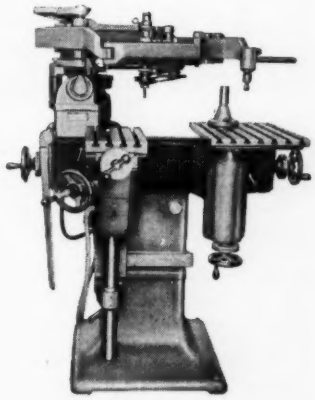

Get a close look at Alexander engravers and die-sinkers, cylinder roller attachments and other accessories.

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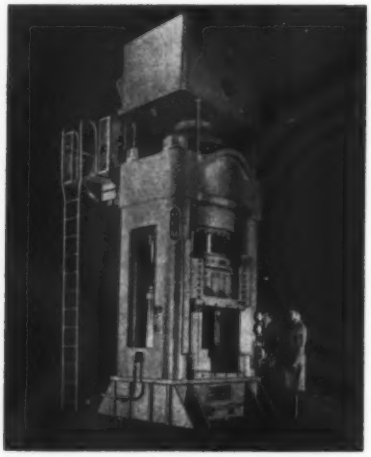
Product News

Plenty Pressure



A huge press with a working area of 48 x 48″, a 39″ stroke and 48″ daylight between bolsters has been built by HPM, Div. Koehring Co. The press is at home in a manufacturing plant which specializes in automotive malleable iron castings. Castings are precision straightened in matched dies. The unit's control system operates either semi-automatically or manually. Changeover can be made without stopping the press. An emergency reverse pushbutton can be depressed during forward travel and reverses the operation without completing the cycle. A safety control prevents the ram from dropping in case of pressure or pilot pressure failure. Write the makers, or circle Inform-A-Gram No. P37.

Coordinated Spindles, Workfeeds

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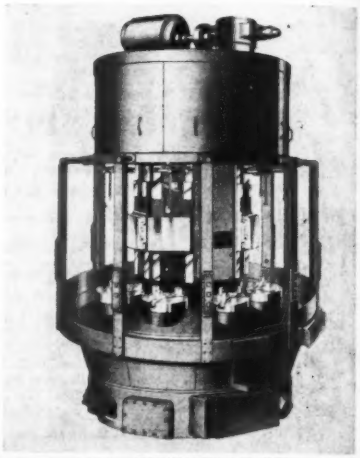

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for FASTER—SAFER—CHEAPER SETUPS

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- Cut setup time by eliminating haphazard blocking.
- Cost only $7.50 per pair; $75.00 per 12 pairs, plus transportation costs. Shipping weight 3 lbs. 10 oz. per pair.

ORDER TODAY. USE THIS COUPON.

HANDY PRODUCTS
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Gentlemen: Please ship ..... pairs of RISER BLOCKS.
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By ..... Title .....
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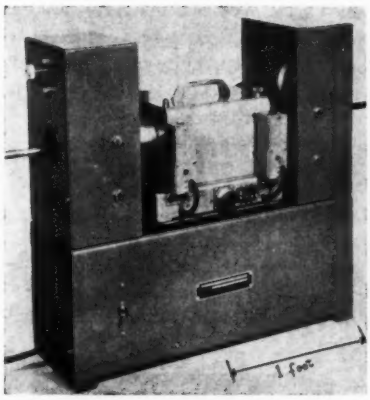
TWENTIETH CENTURY.
MANUFACTURING CO.
Route 176 and Bradley Road
Box 429 TP Libertyville, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1061

Product News

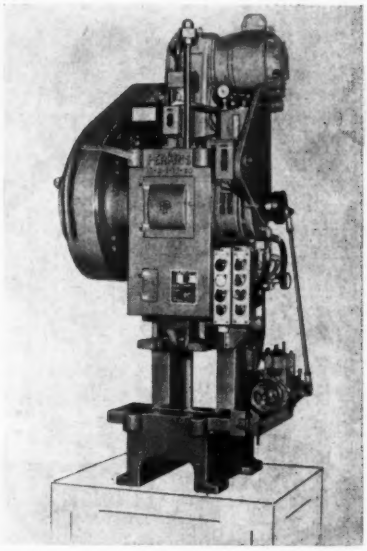
Tubing and Bar Stock Feeding

Positive positioning and positive speeds of feed are now available to handle rod or tubular goods automatically, and with heavy duty mill-type equipment. Model X-2366 tubing and bar stock feeder or its larger counterpart, Model X-2316, are the answer. Model X-2366 accommodates diameters from ¼ to 1½". Its constant speed reduction motor works through a V-pulley arrangement, and offers 2-speed operation, either 180 or 300 fpm. Change of pulley sizes will allow for other speeds. An adjustable platform insures alignment between coil and test part. Write Magnaflux Corp., 7300 W. Lawrence Ave., Chicago, Ill., or circle Inform-A-Gram No. P39.



High Production Stamping Presses

A new group of high-production stamping presses, with capacities from 15 to 150 tons, are speedy and allow easy setting and changing of dies and tools. A rigid frame assures accurate work and longer die life. Perkins Machine Co., Warren, Mass. says the presses feature a very low center of gravity base, which permits fast operation and little or no vibration. Write the makers for Perkins Series S Brochure containing complete specifications, or check Inform-A-Gram No. P40.

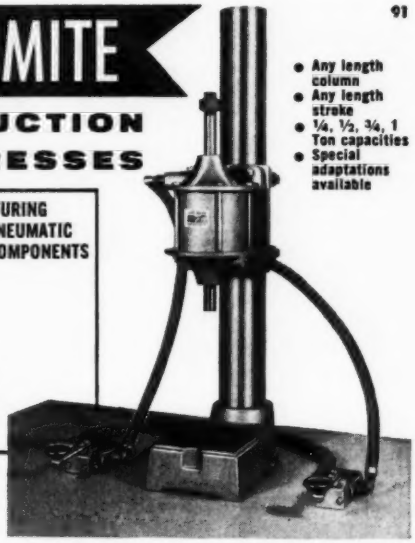


91

AIR-MITE
PRODUCTION
AIR PRESSES

ONE MANUFACTURING SOURCE FOR PNEUMATIC AUTOMATION COMPONENTS
- Cylinders
- Presses
- Valves
- Filters
- Regulators
- Lubricators
- Fittings
- Hose

- Any length column
- Any length stroke
- ¼, ½, ¾, 1 Ton capacities
- Special adaptations available



Air-Mite Production Air Presses are ruggedly built for high production applications. Solid steel column for greater strength and rigidity; compact, powerful cylinders have long, maintenance-free construction features that insure uninterrupted service. Available with a variety of controls for fast, safe operation. Press shown is equipped with two Air-Mite 3-way valves — 1 normally "closed", 1 normally "open." Cylinder will not return for second stroke unless both valves are released.

Write for complete Air-Mite catalog which illustrates and describes the Air-Mite line.

AIR-MITE DEVICES, INC.
4405 Aw Xinzie St., Chicago 24, Ill

CIRCLE INFORM-A-GRAM KEY NO. 1071

V VERTICAL

H HORIZONTAL

Another Model Holding Fixture by ZAGAR

Simplified tooling at reduced cost keynotes Zagar fixtures for drilling, grinding, milling and other finishing operations. The Zagar V-H will:

- SET UP QUICK
- LOAD EASILY
- ELIMINATE NEED OF ANGLE PLATE

Get more information in Reference Sheet 14-T-6.

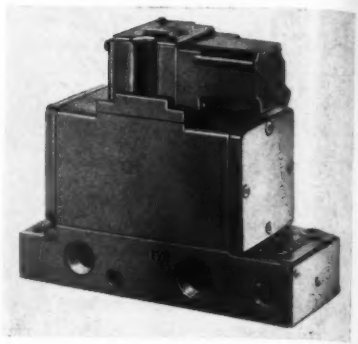
ZAGAR, INCORPORATED
23894 LAKELAND BLVD.
CLEVELAND 23, OHIO
Zagar
TOOLS FOR INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 1072

Product News

Pilot Operated Air Valves

A new line of 4-way pilot-operated control valves boasts a broad work range of 15 to 150 psi, and eliminates many limitations formerly connected with this type of valve. The valves have an exceptionally fast shift and large flow capacity. They can be mounted in any position. Maximum time required after signal to fill a 12 cu in load chamber from 0 to 90 psi (100 psi supply) is 0.029 sec for the ½" valve. Under similar conditions, time required to fill a 100 cu in load chamber is 0.075 sec. Write Hannifin Co., 501 S. Wolf Rd., Des Plaines, Ill., or mark Inform-A-Gram No. P41.



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2, 3, & 4 Flutes
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4811 Lennox Blvd. Inglewood, Calif.

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HARDENED and GROUND HSS BLANKS

Any decimal diameter — any length. Mirror finish surface to gage tolerance.

Many uses — —core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

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WILLIAM T. HUTCHINSON CO.
53 Brown Ave., Springfield N. J.

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JERGENS TOOL SPECIALTY CO.

DEPT. TP-6, 712 E. 163rd ST., CLEVELAND 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1082

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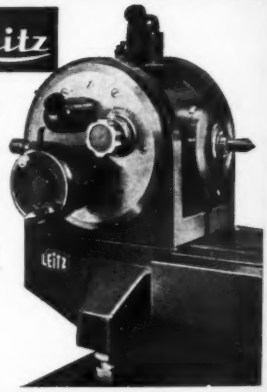
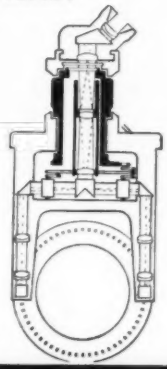
Leitz

Ultra Precision Spacing on guided missile components and similar critical work guaranteed by this exclusive DOUBLE-MICROSCOPIC PICK-UP of the LEITZ OPTICAL MASTER DIVIDING HEAD.





It compensates for runout, the most common source of error. Working accuracy ±1 second of arc.

There is no substitute for LEITZ in optical dividing.

Request catalog 82-1

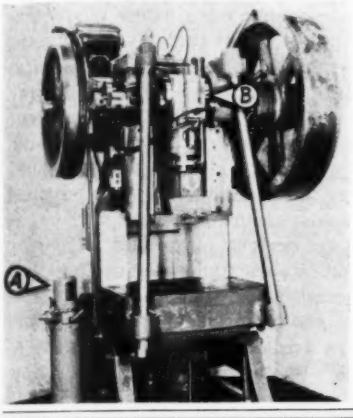
OPTO-METRIC TOOLS, INC.
[illegible]TP VARICK STREET, NEW YORK 13, N. Y.

CIRCLE INFORM-A GRAM KEY NO. 1083

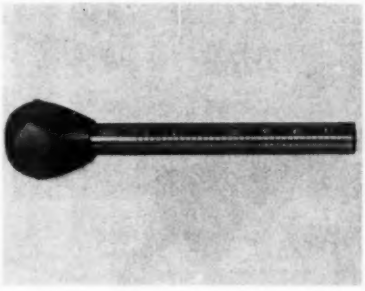
Product News

Overload Pitman

A new hydraulic overload pitman for power presses is suited for briquetting, coining, embossing, marking, pressing, riveting, sizing, stenciling, staking, sub-assembly, and swaging. Dayton Rogers Mfg. Co., 2824-13 Ave. So., Minneapolis 7, Minn. claims its use will prevent broken punch press frames, press frames, broken tools or dies and bent or broken crankshafts. The easy-to-install pitman features a calibrated relief valve that can be set at any desired working tonnage. The pneumatic pumping unit keeps a constant oil pressure on the pitman cylinder. This keeps the pitman precharged to the desired working pressure at all times. Write the manufacturer, or circle Inform-A-Gram No. P43.



Fool-Proof Plug Gage



A new concept in taper tenths plug gages provides extremely accurate readings, even for amateurs. The tool has no moving parts, and the operator is able to read a hole diameter directly to size without removing the gage. Available in sizes from 0.250 to 1.378 in both stock and special units, the taper tenths plug gage is made by Olson Industrial Prod. Co., Inc., 40 W. Water St., Wakefield, Mass. Write them for spec sheets, or check Inform-A-Gram No. P44.

WHY WAIT?
IMMEDIATE DELIVERY!
LARGEST STOCK OF
SPECIAL RH & LH
Taps-Dies &
Thread Plug Gages
Also in Stock:
• RING GAGES • ACME & METRIC TAPS & DIES
• SPECIAL REAMERS
• EX. LONG DRILLS
Write Today for WALL CHART
Special Taps Also Made to Your Print Specifications
Quotations on Request
FIELD TOOL SUPPLY CO.
Industrial Cutting Tools
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All Phones: Financial 6-1195
CIRCLE INFORM-A-GRAM KEY NO. 1091

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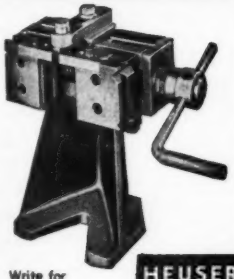

JOHN'S DRILL JIG

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/8" to 9" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs to minimum for 10 to 100,000 pieces.

Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

Write for complete information

HEUSER MANUFACTURING CO.
1642 N. Paulina St., Chicago 22, Illinois
CIRCLE INFORM-A-GRAM KEY NO. 1092

Make 3 hammers AT ONCE!

It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

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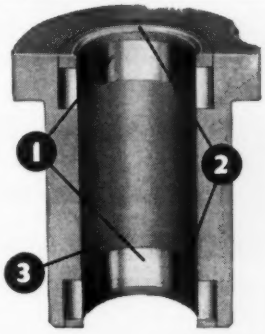
COOK'S LEAD HAMMER SERVICE
48 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.
CIRCLE INFORM-A-GRAM KEY NO. 1093

A Cost Saving

BUSHING STORY IN A NUT SHELL



*PATENTED

1. Tungsten carbide rings at the points of wear; **2.** Steel rings protect drills and carbide; **3.** Special hardened alloy steel body; **4.** Performance: same as solid carbide, but need not be handled with kid gloves; **5.** Greatest economy, because of maximum life at minimum cost; **6.** Enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings.

Write for New Bushing Catalog No. 41

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The Inform-A-Gram Card which follows page 84 is for your convenience in making inquiries about advertised products and editorial articles.

New LOW PRICES . . . same high Quality!

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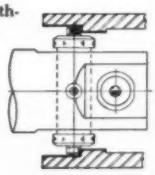
New from Portage Double-Quick . . . a revised price list on the quality SURE-BORE line of boring bar cartridges and accessories . . . no cut-back of quality.

New VERSATILITY . . .

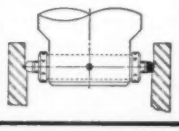
SURE-BORE DOUBLE FEED CARTRIDGES

NO OTHER TOOL can be inserted in a boring bar as economically as Double Feed Cartridges.

Doubles boring feeds without increasing tool load.



. . . easily adaptable to floating reamer as illustrated.



WRITE for new price list

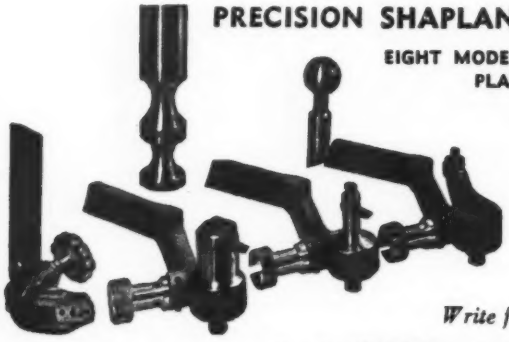
Portage Double-Quick, Inc.

1046 SWEITZER AVENUE • PHONE PORTAGE 2-7425 • AKRON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1101

PRECISION SHAPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS



Range: 3/8" to 3" for concave radii on lathes. Two sizes for convex radii (Balls up to 2½" dia.) on lathes. Also heavy duty model for radii to 6" on planers, etc.

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Patent Pending

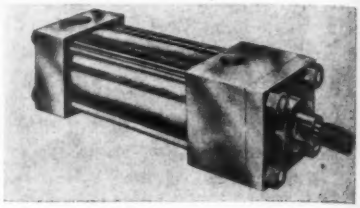
C. B. TEETER - Tool Room Specialties

3443 N. Greenview Ave., Chicago 13, Illinois • Phone DRexel 3-3571

CIRCLE INFORM-A-GRAM KEY NO. 1102

Product News

Strong Air Cylinders



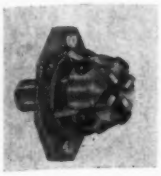
Maximum operating efficiency, long life, and quick and easy maintenance are a few characteristics of a new line of air cylinders. Series K rated at 200 psi, features cold drawn brass cylinder barrel, hard chrome plated, high tensile steel piston rod with a minimum yield strength of 90,000 to 100,000 psi. The cylinders have rolled steel heads, accurately machined to assure perfect alignment of piston rod. Fabricated steel mounts and accessories are accurately machined for precision mounting, and are available for bore sizes 1½ to 14". Write Ortman-Miller Machine Co., 19 143rd St., Hammond, Ind., or check Inform-A-Gram No. P45.

High Production Deburring

Edge blending, deburring, surface cleaning, polishing and buffing applications are in the domain of a new finishing machine from Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio. The new machine is suited for job shop continuous production runs and consists of a two-spindle indexing workholder, and one universal finishing wheel head. The workholder allows inexpensive fixturing, and the M1A finishing head is extremely versatile. Any compound angle can be achieved with built-in setup adjustments. During high production runs, the operator loads and unloads on one spindle while the other spindle performs deburring or finishing. Write, or check Inform-A-Gram No. P46.

Product News

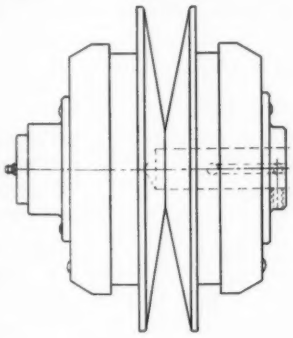
Aligning Hollow Mills



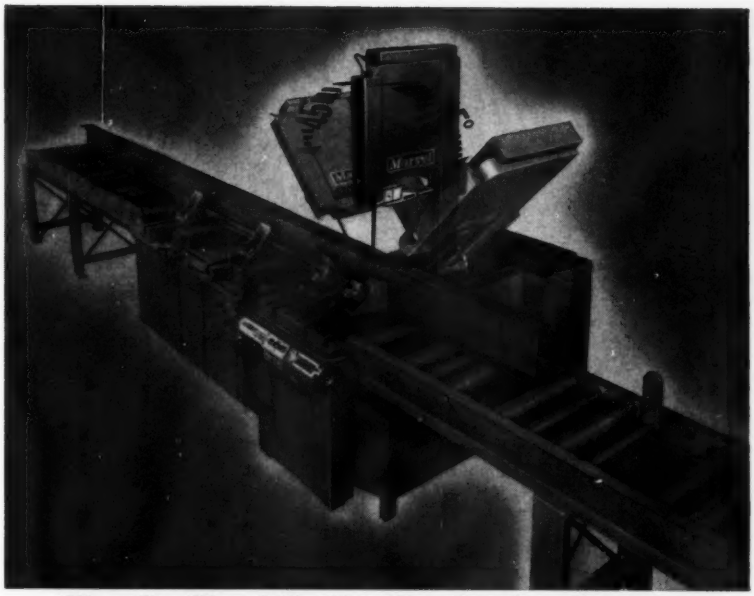
Any machine misalignment can be quickly corrected due to built-in aligning features with new hollow mills from Genesee Mfg. Co., Rochester 21, N.Y. Designed primarily for Brown & Sharpe and Davenport automatics, the mills eliminate separate holders and shorten tool overhang. Style X is recommended for machining materials requiring tools with positive cutting rake, and Style R for tools with zero cutting rake. Capacity range is zero to ⅜" in ⅛" increments. Genesee will furnish additional data, or check Inform-A-Gram No. P47.

Cam Controlled Pulleys

Greater vari-speed efficiency is assured with a new series of wide V-Belt pulleys. The pulleys are manufactured by Hi-Lo Mfg. Co., affiliate of Lovejoy Flexible Coupling Co., 4879-H West Lake St., Chicago 44, Ill. Models 1060, 1160, 1390 and 1590, rated at 1 to 5 hp and 1750 rpm, provide instantly



variable ratios up to 3 to 1. The opposite wedging action of each cam and cam follower prevents pulley spread, assuring constant speed at all times, even with overload. Springs are not driving members; spring assemblies prevent excessive spring pressure and assure longer belt life. Write Lovejoy, or mark No. P48.



Tips Its Head To Cut Production Corners

Sawing 45° miters in any kind of material has always been a simple task for MARVEL Saws, but moving the work up automatically and making consecutive cuts on an angle was a problem, especially when the work was long and cumbersome.

This triple exposure photograph of a new MARVEL No. 81A All Hydraulic Heavy Duty Automatic Bar Feed Band Saw, illustrates how the upright head or column can be tipped 45° either right or left of vertical to make angle or miter cuts. The work is held stationary while the column, which carries the blade, is fed forward, meeting the work squarely to insure accurate cutting. After the cut is completed, the work is automatically moved up and measured, and another cut made.

Automatic miter cutting is just one of many exclusive universal features of these band saws. Designed to utilize every advantage of high speed steel band blades, MARVEL No. 81 Series Band Saws can handle almost any conceivable sawing job—from the smallest, most delicate work, up to 18" x 20" shapes.

Only the MARVEL No. 81 Band Saws have the "SURE-LINE" Automatic Accuracy Control (basic patent applied for) which literally steers a blade to make a straight cut. This unit extends usable blade life as much as 50%.

MARVEL No. 81 Series Band Saws are proving themselves daily, as the most versatile machine tools in production metalworking plants.

For complete details, or a demonstration of MARVEL Sawing Equipment, write: Armstrong-Blum Manufacturing Co., 5700 W. Bloomingdale Ave., Chicago 39, Ill.

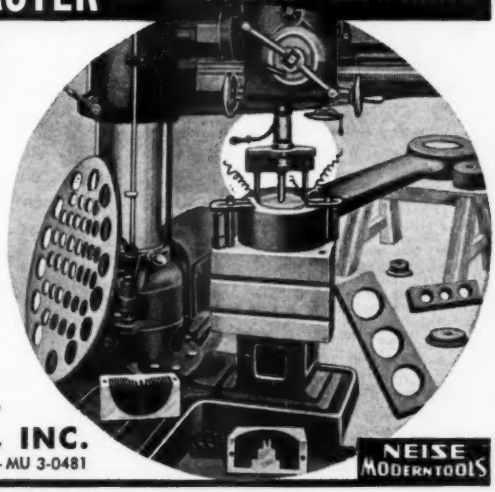
MARVEL Metal Cutting SAWS

CIRCLE INFORM-A-GRAM KEY NO. 1111

THE BOREMASTER for ACCURATE TREPANNING

Bores Holes and Cores in ONE OPERATION

- ★ Bores 6" hole in 3¼" steel in 6 minutes.
- ★ Bores 5" hole in boilerplate in 80 seconds.
- ★ Rigid; Heavy-duty; Easy cutting; Timesaver.
- ★ Excellent chip load distribution.
- ★ 5 Sizes, 1½" to 11¾" to 8" depth.
- ★ With or without retractable pilot.
- ★ **Write for FREE catalog.**



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KARL A. NEISE, INC.

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HEAVY DUTY PUNCH PRESSES

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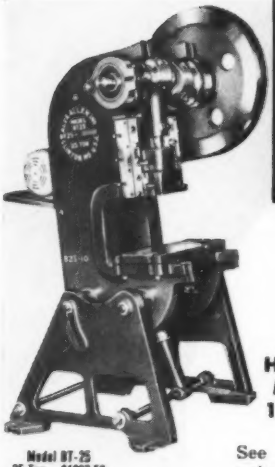
Moderate in Price

Hundreds of different Model Combinations 1 to 25 ton Capacities



Model BT-25
25 Ton—$1897.50
less motor—fob

Model LTX
Special Duty
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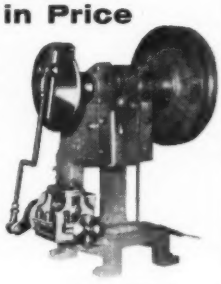
less motor—fob

See your Supply Dealer or write for catalog giving complete information, specifications and prices on our line of Heavy Duty Punch Presses.

Thousands in Use the World Over



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as low as—$145.00

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less motor—fob

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12 Ton—$437.50
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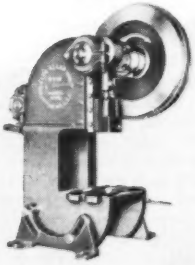
less motor—fob



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Model BT-8
8 Ton—$299.50
less motor—fob

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Buys This Compact Mist Coolant Unit

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TYPE "J"

*Complete With Magnetic Nozzle Holder As Shown (In U.S.A.)

Especially designed for small precision machinery used for drilling, tapping, sawing, grinding, etc. Up to 500% savings through increased cutting speeds and tool life. Check these quality features and write for complete details.

- ***compact . . . measures 3" x 5"***
- ***separate air and coolant controls***
- ***convenient mounting stud***
- ***attaches to existing shop airline***
- ***shatter-proof 8 oz. reservoir***
- ***neoprene flexible coolant line***
- ***magnetic nozzle holder positions anywhere***
- ***controlled discharge***

Larger Types and Capacities Available

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Product News

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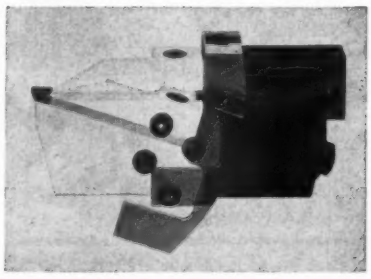

and can be set on zero rake or any positive rake angle up to 16°. Rake angle settings are marked on the tool from 0 to 16° in multiples of 2°, although there are no serrations or other limitations to infinite rake adjustments. Rake position is held rigid by two locking screws and a beveled circular T slot. Additionally, the selected angle is held constant because the point of cutting is always on center. New rake angles can be set without removing tool or losing center. A special blade support holds inserts on center throughout the cut and increases tool life under heavy feeds. Write Portage Double Quick, Inc., 1046 Sweitzer Ave., Akron 11, Ohio, or P49.

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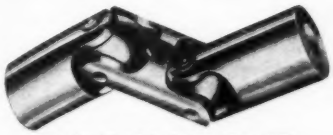

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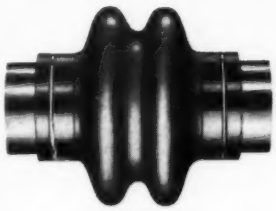

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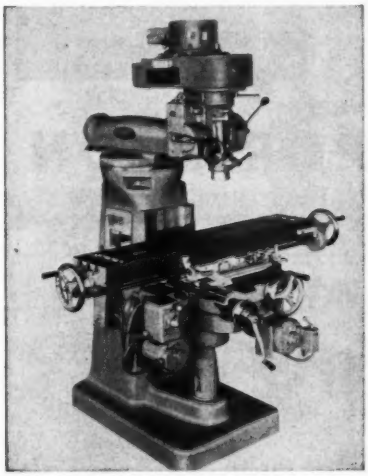

From spindle centerline to the column ways the distance ranges from 1½ to 27¼" but varies as the head is tilted backward or forward. Cross travel of table is 10" with a longitudinal travel of 26" on the standard 9 x 40" table. Write Index Machine Co., 541 N. Mechanic St., Jackson, Mich., about other features, or check Inform-A-Gram No. P50.

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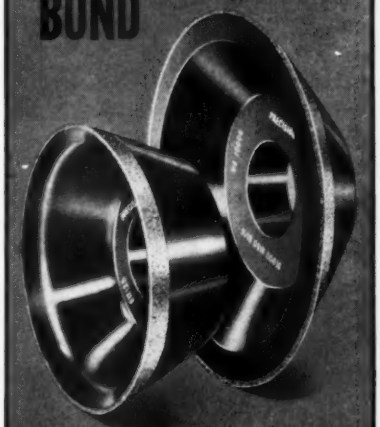

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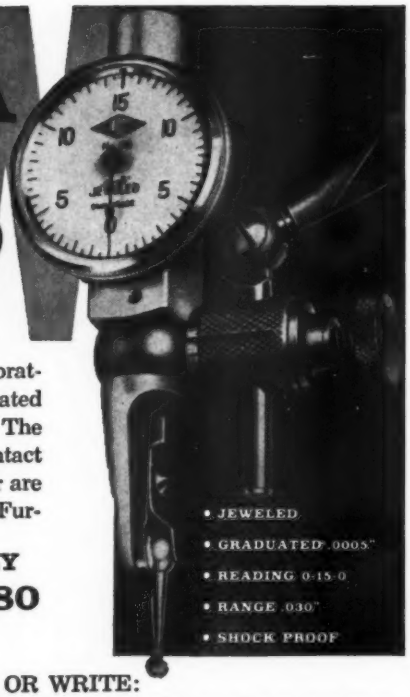

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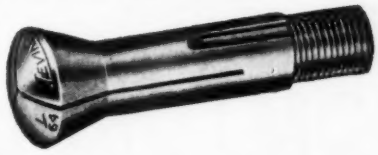

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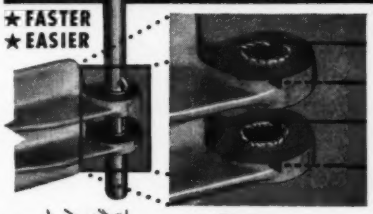

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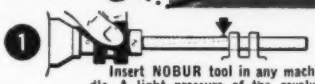
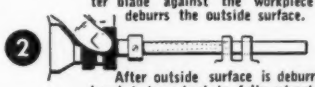
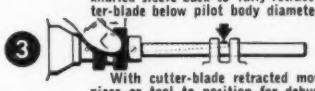


1 Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.



2 After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.



3 With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

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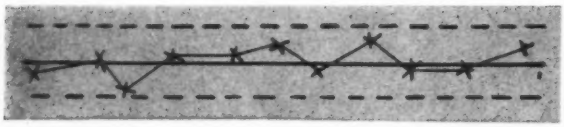

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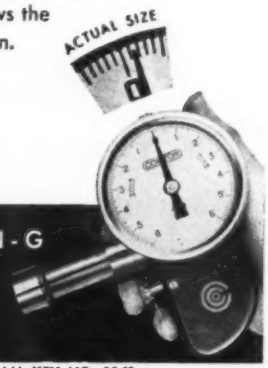

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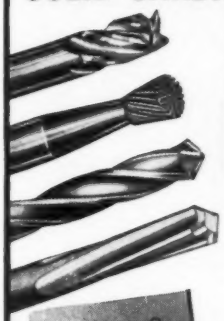

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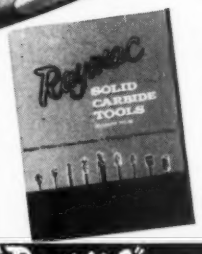

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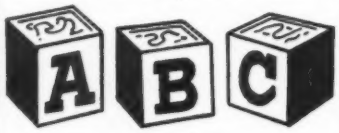

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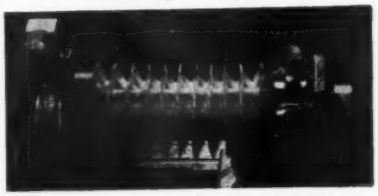

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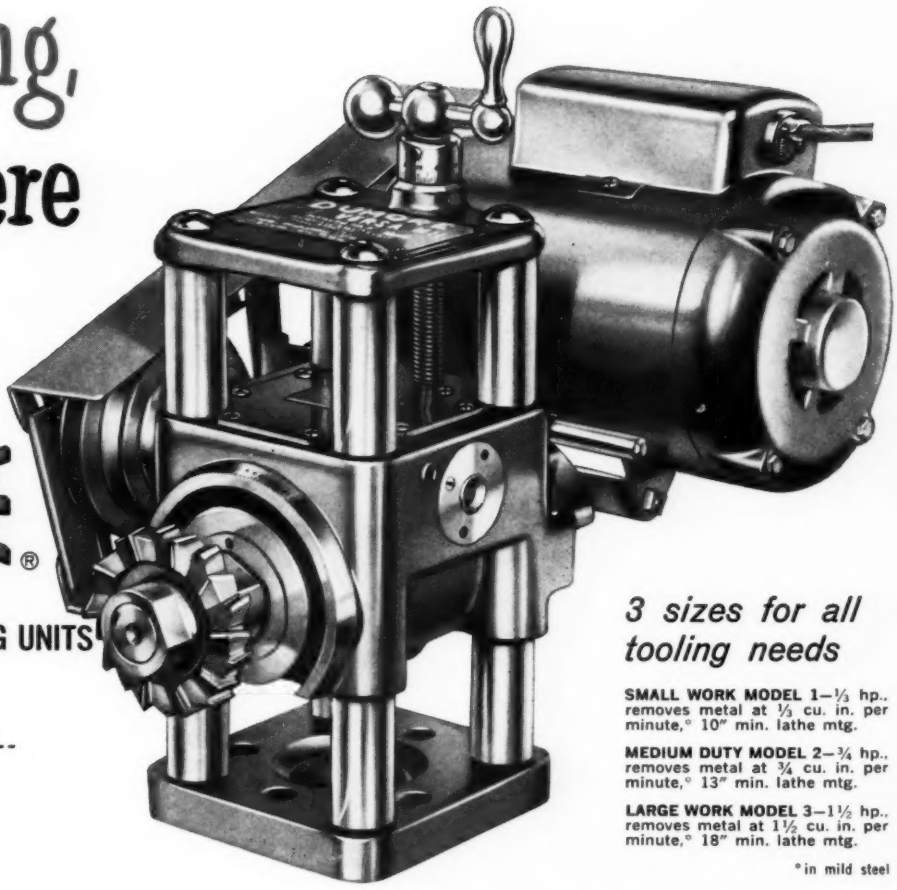

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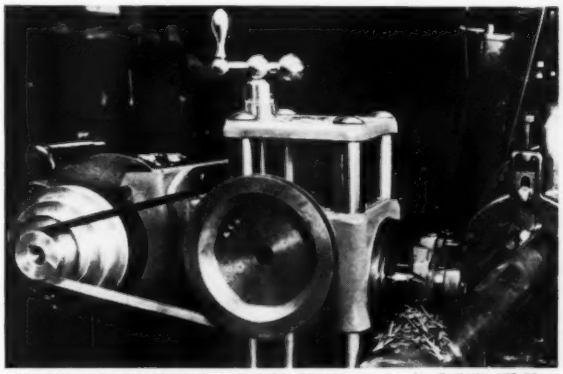

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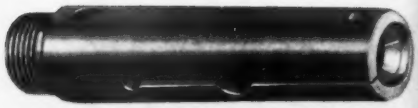

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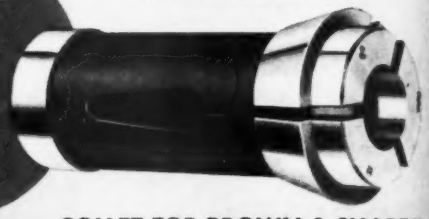

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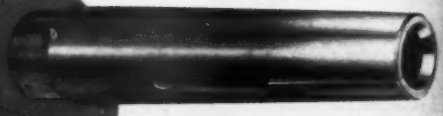

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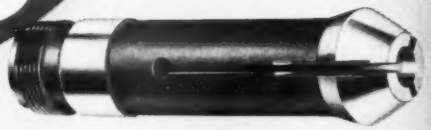

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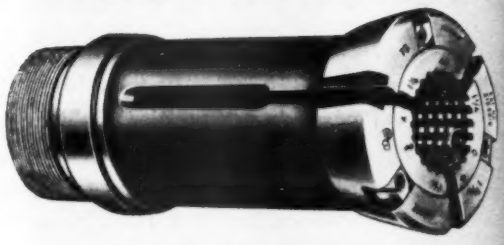

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